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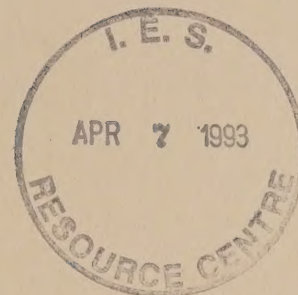
Ontario. Environmental Assessment Board.

EA-91-01

LAIDLAW WASTE SYSTEMS LIMITED - STORRINGTON LANDFILL

SITE REASONS FOR DECISION AND DECISION... 1993.

CA2ONEA 93E011



ENVIRONMENTAL ASSESSMENT BOARD

EA-91-01

LAIDLAW WASTE SYSTEMS LIMITED -

STORRINGTON LANDFILL SITE

REASONS FOR DECISION AND DECISION

IN THE MATTER OF the *Environmental Assessment Act*, R.S.O. 1990 c. E-18, the *Ontario Water Resources Act*, R.S.O. 1990 c. 0-40, the *Environmental Protection Act*, R.S.O. 1990 c. E-19 and the *Intervenor Funding Project Act*, R.S.O. 1990 c. I-13;

- and -

IN THE MATTER OF an undertaking by Laidlaw Waste Systems Ltd. to extend the Storrington Landfill located on Lot 18, Concession VII in the Township of Storrington in the County of Frontenac.

BEFORE: Jim Robb - Chair
Elaine Tracey - Member

DATED at TORONTO this 31st DAY of MARCH 1993
2300 Yonge Street
Suite 1201
Toronto, Ontario M4P 1E4
Tel: (416) 323-4806

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GLOSSARY OF TERMS

ASL	Above Sea Level
Board	Environmental Assessment Board
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CofA	Certificate of Approval
°C	Degrees Centigrade
db	Decibel
DEE	Diethyl Ether
EA	Environmental Assessment
<i>EA Act</i>	<i>Environmental Assessment Act</i>
<i>EP Act</i>	<i>Environmental Protection Act</i>
g/m ² day	grams per square metre per day
ha	Hectares
ICI Waste	Industrial, Commercial & Institutional Waste
KWMMP	Kingston Waste Management Master Plan
L/min	Litres per Minute
LIL	Leachate Indicator List
mg/L	Milligrams per Litre
MNR	Ministry of Natural Resources
MOE	Ministry of Environment
MTS	Marsh Treatment System
NMOCs	Non-methane Organic Compounds
ODWO	Ontario Drinking Water Objectives
OMB	Ontario Municipal Board
OP	Official Plan
OPA	Official Plan Amendment
<i>OWR Act</i>	<i>Ontario Water Resources Act</i>
PLC	Public Liaison Committee
ppb	Parts per Billion
ppm	Parts per Million
Proponent	Laidlaw Waste Systems Ltd.
PSC	Pre-submission Consultation
PWQO	Provincial Water Quality Objectives

RBC	Rotary Biological Contactor Leachate Treatment Process
RMOC	Regional Municipality of Ottawa Carleton
RUL	Reasonable Use Limits
RUP	Reasonable Use Policy
SCAT	Storrington Citizens Against Trash
SIA	Social Impact Assessment
ss.	Subsection
SWD	Solid Waste Disposal
Tri-site	Trail Road, Rump & Cornwall Landfills
ug/L	Micrograms per litre
Undertaking	Proposal
USEPA	United States Environmental Protection Agency
WPCP	Water Pollution Control Plant

Appearances:

Neal J. Smitheman	-	The Proponent, Laidlaw Waste Systems Ltd.,
John Zimmer		
Diane Lemieux		
Mark O. Mattson	-	Storrington Committee Against Trash (SCAT)
Theresa McClenaghan		and the Mike Mundell Coalition
Howard Baker	-	Environment Canada, Canadian Parks Services
Adrienne Scott	-	Ministry of the Environment
Angus Bruce	-	On his own behalf
Gayle Dixon	-	On her own behalf
Murray B. Gorham	-	Township of Storrington
Norman Jackson	-	City of Kingston
Peter Swan	-	Township of Kingston
T. Wilkin		

Public Witnesses:

Brian Heatherington	Robert Heaney Jr.
Nadine Heaney	Sharon Murphy
Vincent Murphy	Marjorie Smith
Doug Fletcher	Robert Heaney Sr.
Mike Mundell	Dwayne Campbell
Sheri Vivian	Mike Crellian
Luke Kelly	Rita Campbell
Melanie Heaney	Karen Crellian
Betty Smith	Linda Mundell
Joe Beeler	Ian Cunningham
Mrs. Whittman	Paul Stanton
Sylvia Aldridge	C.G. Larry Rutter
Mrs. Reis	

Witnesses for Environment Canada:

J.F.T. Carreiro

Witnesses for Laidlaw:

Robert J. Redhead

Douglas MacDonald

John Coulter

Peter Marshall

Dr. David E.J. Creasy

D.R. Rooney

Victoria McCulloch

Derek Smith

Stephen A. Black

Ronald J. Poland

John McDermott

Matthew P. McKim

T. Turner

Dr. Roger Woeller

David Harding

Peter Homenuck

Byron O'Connor

Mike Walters

Witnesses for SCAT:

Douglas J. Robertson

Sherry Vivian

Doug Fletcher

Ron H.J. Huizer

Wilfred Ruland

Luke Kelly

Robert Heaney Sr.

James. R. Yardley

Janet Fletcher

Andrew Lugowski

Stephen Rayner

Dr. William J. Racz

Nadine Heaney

Mr. and Mrs. Robert Heaney Jr.

Witnesses for the MOE:

John C. Bullen

John D. Bishop

Henry Kronis

Ted C. Reeves

Eric Loi

Paul Nieweglowski

Dr. R. Manoharan

Brian G. Kaye

Scott Grant

Angus McAllister

Witnesses for the City of Kingston:

Gerard de Lugt
H. Leslie MacMillan

Bert Meunier

Witnesses for the Township of Kingston:

Gary Stefan

H. Leslie MacMillan

Witnesses for the Township of Storrington:

Simon Ainley
Reeve Ron Sleeth

John A. McKee

SUMMARY OF THE BOARD'S DECISION

Final Determination and Decision

A fine balance exists between the weight of evidence supporting the acceptance and approval of the Storrington Landfill EA and the weight of evidence supporting its rejection. The Board has carefully weighed the evidence in light of the purpose and provisions of the *EA Act*. The Board believes that the cumulative environmental impacts of the Storrington Landfill extension can be prevented, mitigated or remedied. However, the fine balance can only be tipped towards approval based upon the thorough terms and Conditions of Approval that the Board has formulated after considering the hearing evidence.

The Board therefore approves the proposed Storrington Landfill extension subject to the detailed terms and conditions necessary to prevent, mitigate or remedy the potential adverse environmental impacts. The Board also Orders that Storrington By-law 1978-15 as amended by By-law 1986-17 should not apply to the Landfill extension.

The following summary highlights the main components of the Board's Decision. The actual Decision provides a more comprehensive evaluation of the hearing matters.

Acceptance of the EA

The Board accepts the conclusion of the Government Review - the proponent's Environmental Assessment (EA) complies with the minimum planning requirements of subsection 5(3) of the *Environmental Assessment Act (EA Act)*. Although the EA does not completely satisfy the emerging expectations of the public, the EA Branch or the Board, the following relevant circumstances have factored into the decision on acceptance:

- the conclusion of the Government Review that the EA complies with the minimum requirements of the *EA Act*;
- the preparation and submission of an *EP Act* application prior to the *EA Act* designation;

- the private proponent's expectation that the *EP Act* application would service its ongoing waste disposal contracts with the City and Township of Kingston;
- the guidance that was available from the agencies of the Ontario Government (eg. Ministry of the Environment, Ministry of Natural Resources) and from Board decisions;
- the MOE's acquiescence to the time constraint placed on the EA process;
- the factoring of the provincial waste reduction and diversion targets into the calculation of the need for disposal capacity;
- the duration and quantity of need that has been established;
- the potential environmental, social and economic consequences of rejecting the EA; and,
- the Board's ability to carefully examine the preferred alternative before determining whether the undertaking should be approved.

After considering the EA, the evidence, the unusual circumstances, and the established period of need, the Board determined that the provisions and purpose of the *EA Act* are not violated by the acceptance of the Storrington EA.

Demonstration of Need

The Board's evaluation of need is divided into two main components. The first component evaluates the requirement for landfill disposal capacity after considering the other feasible alternatives to disposal. The second component of need evaluates the proposed solution (i.e. a 980,000 tonne, ten year extension to the Storrington Landfill) in relation to the established size and duration of the need. These components of need were addressed with the purpose of the *EA Act* in mind.

The Board concluded that the "do nothing" alternative promotes the undesirable continuation of crisis waste management and waste exportation. After considering the evidence of a consultant for the Kingston Waste Management Master Plan and the probable result of the "do nothing" alternative, the Board is satisfied that the need for disposal capacity has been reasonably demonstrated.

Period and Quantity of Disposal Capacity

The Storrington Landfill extension is largely based on the "interim need" for disposal capacity pending the completion of the Kingston Waste Management Master Plan (KWMMP) and the development of a new municipal disposal site. The KWMMP was expected to provide a municipal disposal site by 1996.

Shortly before the EA hearing, the consultants for the City and Township of Kingston were asked to re-assess the KWMMP's rate of progress and develop an updated critical path for the plan's completion. The re-assessment predicted a revised completion date of December 2002.

The residents near the vicinity of the Storrington Landfill were represented by a group called Storrington Citizens Against Trash (SCAT). SCAT viewed the revised completion date for the KWMMP as a conscious effort to bolster the establishment of a ten year need for the Storrington Landfill extension. The Board believes that the evidence presented by SCAT established reasonable grounds for linking the potential availability of disposal capacity at the Storrington site with the revised prediction for the completion of the KWMMP.

SCAT also raised the issue of siting equity and asked the question: Should the "betterment of the whole" be achieved at the expense of "the part"? In other words, should the waste disposal needs of the entire Kingston area continue to be satisfied at the expense of the community and the natural environment surrounding the Storrington Landfill Site.

The citizens surrounding the Storrington Landfill have already shouldered the waste disposal burden for a significant portion of the Kingston area for more than fifteen years. The cumulative impact on the local rural community and on the environment increases with each additional year that the Storrington Site receives waste. According to the local community, the existing Storrington Landfill, the rural neighbourhood, and the surrounding environment should be allowed to heal. The Board cannot fault the local community for this perspective.

The MOE also disagreed with the revised estimate (December 2002) for the completion of the KWMMP. Based on a commitment to streamline the government review period, the MOE predicted that the Municipal site could be available by May of the year 2000.

The Board has considered the MOE's prediction and the possibility for some unavoidable slippage in the critical path of the KWMMP. The Board believes the duration of need can be reasonably extended to the end of the year 2000. If the Township and the City of Kingston are diligent in their search for a municipal waste disposal site, an alternative site should be available before the end of the year 2000.

The Board has considered: the time constraint used in the Storrington EA's early elimination of alternatives to landfilling at Storrington; the weaknesses of the proponent's public consultation process; the weaknesses of the proponent's consideration of the natural environment; the comments of the Government Review; the legitimate issues of siting equity; and the scarcity of evidence and documentation to support a ten year period of landfilling and a 980,000 tonne capacity. The Board concludes that the proponent has demonstrated a need for disposal capacity of only 600,000 tonnes between the potential re-opening of the Storrington Landfill and the end of the year 2000.

The Board recognizes that the reduced capacity may have an impact on the viability of the proposed extension, however, the proponent's EA and the evidence did not support a larger disposal capacity or a longer term.

Should By-law 1978-15 (as amended) Apply

The Board does not question the reasonableness of By-law 1986-17 regarding the specification of set-backs between landfill sites and water bodies or residential land uses. Set-backs can be a valuable planning tool for reducing potential conflicts between different land-uses. However, *EP Act* section 36 permits the Board to determine that a By-law should not apply if it frustrates the location of a landfill site on an environmentally acceptable site.

The EA hearing involved a thorough examination of the land-use, social, ecological and economic impacts of the proposed extension of the Storrington Landfill. Under this circumstance, the Board believes that the consideration of whether the by-law should apply is subsidiary to the proposal's compliance with the purpose and provisions of the *EA Act*. Therefore, if the public's interest in the protection, conservation and wise management of the environment is satisfied by the proposed Landfill extension, then the by-law should not apply.

Should the Storrington Landfill Extension Be Approved

The Board has considered a number of standards that are relevant to the assessment of environmental impacts, including: the public interests represented by the hearing participants and parties; the Provincial Water Quality Objectives for surface water protection; the MOE's Reasonable Use Policy for groundwater protection; the MOE Policy for protecting residential properties from excess noise; the MOE Point of Impingement Standards for air quality protection; and the Provincial Policy for Wetland Protection. The Board has also considered: the historical, current and potential sources of impact from the Landfill; the non-landfill related sources of impact; the frequency, duration and magnitude of potential environmental impacts; and the sensitivity and assimilative capacity of the surrounding environment.

The evidence reveals that the natural assimilative capacity (tolerance) of the surrounding community and natural environment has been diminished by two decades of landfilling and other local land uses (eg. farming and aggregate extraction). Several environmental features are already approaching or exceeding their limits of tolerance. For example: the nearby Rideau Canal contains phosphorus levels that exceed the maximum desirable concentrations specified by the Provincial Water Quality Objectives; the groundwater beneath the proponent's property is being utilized to dilute the leachate plume from the existing refuse area; and the surrounding community is receiving landfill gas and odours from the closed and capped portion of the site.

The proponent's EA process failed to thoroughly consider the mitigation costs that would be required to prevent unacceptable cumulative impacts to the social and natural environment surrounding the Storrington Landfill. However, the EA hearing process resulted in the introduction of a number of positive and innovative measures for preventing or minimizing environmental impacts. For example: the capture of landfill leachate through an underdrain collection pipe system above a low permeability liner; decontamination of landfill leachate through an enclosed biological, physical and chemical treatment process; the capture of the leachate plume from the existing site through purge wells that discharge to the leachate treatment facility; and active gas collection and combustion for removing objectionable odours and noxious Landfill gases.

The proponent, the City of Kingston and the Township of Kingston noted the importance of providing economically attractive landfill disposal capacity within the Kingston Area. However, there are additional economic factors that must be considered to protect, conserve and wisely manage the environment - the purpose of the *EA Act*.

Over ten million dollars of the potential revenues from the Storrington Landfill site were allocated to Storrington Township to secure a Host Municipality Agreement. The potential costs to prevent adverse environmental and social impacts are of a similar magnitude. The Board believes that the allocation of funds towards the prevention and mitigation of environmental and social impacts is most consistent with the purpose of the *EA Act*.

If social and environmental costs are not properly factored into waste management decisions, waste diversion and reduction initiatives will be undermined and landfill sites will continue to be viewed as an utterly unacceptable neighbouring land-use. The result of failing to internalize these costs is the polarization of proponents and potentially impacted communities and the mobilization of complex social and political forces. This polarization has resulted in a costly, contentious and time-consuming waste management planning process. The Board notes the merit of the following comments by the MOE's social impact assessment specialist (Volume 40, p. 59):

... there is a cost to society of unresolved conflict and there's a cost to public institutions when conflicts are not resolved in a way the public can accept - they might not like it but they can accept it the credibility of public institutions begins to diminish and conflicts and divisions increase in society ...

If the inequities that lead to such conflict are to be reduced, the social and environmental costs of landfill capacity must be thoroughly accounted for in waste management planning and decision-making. The proposed Storrington extension is in close proximity to the Rideau Canal, several rural residences, the Storrington swamp and stream, and the provincially significant Washburn wetland. The close proximity of these sensitive environmental features should have alerted the proponent to the potential for significant mitigation costs during the site selection process. However, the potential costs of preventing adverse impacts to these features were not thoroughly integrated into the proponent's EA process until during the hearing. The result is a proposal that can only be approved subject to detailed Conditions of Approval.

Summary of Conditions of Approval

The terms and conditions prescribed by the Board are necessary to avoid unacceptable environmental impacts to: the surrounding rural community; the long term quality of domestic well water and groundwater resources; the provincially significant Washburn Wetland; the nearby Rideau Canal; and the Storrington Swamp and stream.

The complete and precise Conditions of Approval are contained in Part V of the Board's Decision. However, the following is a summary of the Conditions of Approval:

- The Landfill shall close on, or before, December 31, 2000.
- The Landfill shall receive a maximum of 600,000 tonnes of waste.
- The Landfill shall receive only solid, non-hazardous domestic, commercial, industrial and institutional waste.
- The site shall be closed on Sundays and all statutory holidays. The site shall also remain closed on Saturdays, with the exception of Saturdays that are associated with a Friday or Monday Statutory holiday.
- The Company shall take all reasonable steps to form a Public Liaison Committee (PLC) prior to the construction and development of the landfill extension. The goal of the PLC should be to work co-operatively towards the avoidance of off-site impacts from the Landfill.
- The PLC shall include provisions for the following membership: three members and three alternates chosen annually by the residents living within 800 metres of the site (3 votes); one representative from the Ministry (the Ministry may designate an alternate) (1 vote); two representatives of the Company (the Company may designate two alternates) (2 votes); one non-voting member from the Township of Storrington and one designated alternate; and a Chair person chosen by the consensus of all members for a renewable one year term. The Chair will only vote to decide an issue that would otherwise result in a deadlock.
- Prior to the commencement of site preparation, the Company shall provide \$100,000 for the operation of the PLC during 1993. Thereafter, the proponent shall provide the PLC with a yearly funding of \$35,000 until at least five years after the site is closed, capped and vegetated. Surplus funds at the end of a given year shall be added to the funding for the following year. Funds remaining five years after the site closes shall be utilized for any ongoing operation of the PLC.

- The PLC shall develop an annual budget and a disbursement control system for accomplishing: better complaints response; independent monitoring of groundwater, surface water, gas, noise and ecosystem health; independent interpretation of Landfill monitoring results; waste reduction and diversion awareness and initiatives; newsletter production and distribution; and habitat enhancement projects around the landfill.
- The Landfill design and operation shall contain the following pollution prevention and abatement features:
 - a complete leachate containment and collection system for the proposed extension;
 - a purge well system to capture leachate from the existing site;
 - an enclosed leachate treatment plant to decontaminate leachate and purge well water through a biological, chemical and physical treatment process;
 - an active gas collection and combustion system for effectively eliminating malodorous and noxious landfill gases from the existing site and the proposed extension;
 - an ecologically designed system of vegetation, sediment control devices, ditches and stormwater ponds to control surface water quality and quantity, to prevent adverse cumulative impacts to the water quality in the nearby Rideau Canal and to enhance aesthetics and wildlife habitat;
 - a thorough ongoing program to monitor groundwater, surface water and landfill gas around the perimeter of the Landfill to ensure compliance with the relevant MOE policies and the Board's Conditions of Approval;
 - a plan to protect property values and mitigate residual nuisance impacts for residential properties within 800 metres of the Landfill along the Washburn Road;
 - specific requirements to reduce nuisance impacts such as noise, traffic, dust, litter and vermin (eg. a large berm around the southern and eastern perimeter of the extension area and small berms around active landfill areas);
 - a plan to monitor domestic wells along the Washburn Road within 800 metres of the Landfill;
 - a plan to assure the provision of domestic water in the unlikely eventuality that a local domestic well becomes contaminated with Landfill leachate;

- the establishment of a treed fifteen metre buffer zone around the perimeter of the proposed Landfill extension to reduce visual impacts from the adjacent rural roads, the surrounding rural community and the Rideau Canal;
- a requirement for initial and ongoing ecological surveys to protect and monitor the health of the provincially significant Washburn Wetland and the Storrington Swamp and discharge stream; and,
- a requirement for financial assurance to ensure that adequate funds are available to operate and maintain necessary pollution prevention and abatement facilities over the contaminating lifespan of the site.

The Board encourages the review of the actual Decision for more detailed information on specific hearing matters. The Decision is organized into many topics that are outlined in the Table of Contents.

DECISION AND REASONS FOR DECISION

BOARD JURISDICTION AND DECISION-MAKING FRAMEWORK

The Minister of the Environment referred two principal matters to the Board. The first matter relates to the *Environmental Assessment Act* (EA Act) application for the proposed extension of the Storrington Landfill. The second matter relates to a Township of Storrington by-law and the *Environmental Protection Act* (EP Act). Appendix A contains a brief synopsis of the most relevant sections of the EA Act.

The Board's decision-making function under the EA Act encompasses two distinct determinations. The Board must first determine if the proponent's Environmental Assessment (EA) satisfies the rational planning framework of subsection (ss.) 5(3) of the EA Act and therefore forms an "acceptable" basis for good decision making. If the Board finds the EA acceptable, then it must determine whether the undertaking should be granted approval, and if so, the terms and conditions of the approval.

Pursuant to section 36 of the EP Act the Board was also asked to determine whether Storrington Township By-law 1978-15 as amended by By-law 1986-17 should apply to the proposed landfill extension. This by-law specifies: "No landfill site shall be located within 800 metres of any waterbody, residential or commercial zone boundary or any existing dwelling".

DECISION FORMAT

The Board's written reasons for its decisions are divided into the following six parts:

- Part I provides general background information;
- Part II examines the EA and the hearing evidence to assess compliance with ss. 5(3) of the EA Act and to reach a determination on whether the EA forms an "acceptable" basis for good decision-making (EA Act subsection 12 (2)(c));
- Part III examines whether Township of Storrington By-law 1978-15 as amended by By-law 1986-17 should apply to the proposed Landfill extension;

- Part IV examines the proposed undertaking in the context of the social, ecological and economic considerations that are relevant to the *EA Act* decision-making process. The Board then determines whether the undertaking should be granted approval (*EA Act* subsection 12(2)(d));
- Part V specifies the terms and conditions that will apply to the approval (*EA Act* subsection 12(2)(e)); and
- Part VI contains appendices to the Board's decision.

PART I - INTRODUCTION

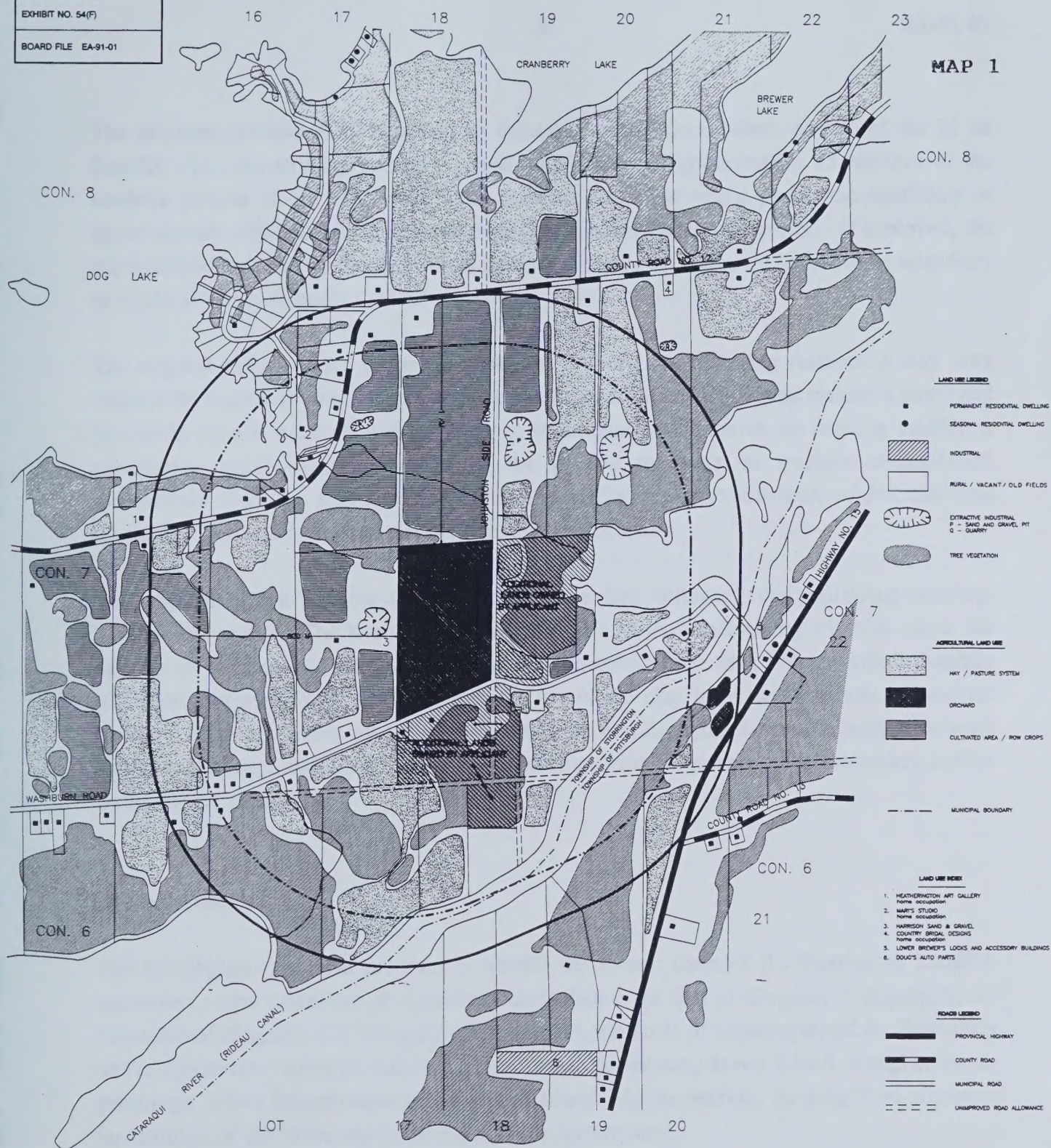
Location

Figure 1 is a map of the local setting of the Storrington Landfill Site. The Landfill is situated approximately twenty five kilometres northeast of the City of Kingston in the vicinity of the Rideau Canal. Highway 15 is located approximately a kilometre to the southeast of the site and County Road 12 is located less than a kilometre to the north.

The landfill site is comprised of part of lot 18, concession VII, in the Township of Storrington ("Storrington"), County of Frontenac. The site is bounded by Johnson Sideroad to the east, Washburn Road to the south, the Harrison Sand and Gravel property to the west, and the Barmin property to the north. In addition to the Landfill Site, the proponent owns a total of approximately 35 hectares of buffer lands to the east of Johnson Sideroad and the south of Washburn Road.

Proposed Undertaking

The proponent (Laidlaw Waste Systems Limited) seeks approval for the development, operation, maintenance, progressive rehabilitation and closure of a 1.368 million cubic metre (m³) solid non-hazardous waste disposal site and associated facilities.



SOURCE: McDERMOTT AND ASSOCIATES LIMITED,
LAND USE SURVEY, NOVEMBER 1991
AQUARIUS FLIGHT, AERIAL PHOTOGRAPHS
ROLL NO. 81491, PHOTOS 818 TO 822 INCLUSIVE
ROLL NO. 81491, PHOTOS 842 TO 847 INCLUSIVE
ROLL NO. 81581, PHOTOS 733 TO 739 INCLUSIVE
DATE FLOWN: NOVEMBER 1991

EXISTING LAND USE - 1992
PART LOTS 14 TO 23, CONCESSIONS 6, 7 AND 8
TOWNSHIP OF STORRINGTON AND
PART LOTS 16 TO 22, CONCESSIONS 6, 7 AND 8
TOWNSHIP OF PITTSBURGH

The proposal involves a 10 hectare (ha) extension within the southern portion of the 24 ha Landfill site. An existing and now closed landfill covers approximately 13 hectares of the northern portion of the 24 ha site. The proposed extension would permit the landfilling of approximately 980,000 tonnes of waste over approximately a ten year period. If approved, the site would be operated by Laidlaw Waste Systems (Storrington) Ltd., a wholly-owned subsidiary of Laidlaw Waste Systems Limited (Canada).

The original design of the proposed expansion included the following features: a clay liner beneath the landfill to contain leachate; a perimeter leachate collection pipe system; a pump and forcemain pipe to recirculate leachate to an infiltration trench above the existing landfill; a constructed marsh channel system for the passive treatment of leachate contaminated groundwater from the site; and provisions for remedial action to intercept, control and treat leachate, if the marsh treatment system proves unsatisfactory.

The original design features were significantly revised following the prehearing meetings between the parties. The Board was presented with a revised undertaking which featured: the deletion of the leachate recirculation proposal; the construction of a full underdrain leachate collection system to drain leachate from the top of the clay liner; the treatment of leachate collected from the existing site and the proposed extension through a Rotary Biological Contactor (RBC) technology; and other proposals and contingencies for protecting groundwater, surface water and air quality.

Service Area

The Storrington expansion proposes to service the former users of the Storrington Landfill. According to the Certificate of Approval, this includes: the City of Kingston ("Kingston"), the Township of Kingston, the Township of Storrington, the Town of Gananoque and the Townships of Adolphustown, Amherst Island, Camden East, Ernestown, Howe Island, Loughborough, Pittsburgh, South Fredericksburgh and Wolfe Island. At the hearing, the proponent requested the addition of the Township of Portland to the service area.

Site History

The existing landfill began operation in 1971 under the authority of a provisional certificate of approval. In 1973, the site was acquired by Tricil Limited ("Tricil") and the City began disposing of its waste at the Storrington Site in 1975. In 1981, the Storrington Landfill was extended following a hearing before the Environmental Assessment Board (the Board) pursuant to the *EP Act*.

Tricil began investigating the possibility of further extending the Storrington landfill in 1985. Hydrogeology and feasibility studies were completed during the period of 1985-87 to support an application under the *EP Act*. In 1987, Kingston Township's landfill closed and the Township began sending its waste to the Storrington site.

The *EP Act* application was submitted to the MOE in January 1988. However, the MOE announced a change in policy in the spring of 1988 that required an environmental assessment of the proposal to extend the Storrington Landfill. Tricil began the presubmission consultation phase of its environmental assessment (EA) process in the summer of 1988.

The landfill was expected to reach capacity in late 1988 before the EA process could be completed. Therefore, Tricil submitted a new *EP Act* application in June 1988 to increase the approved final contours. A capacity increase of 150,000 m³ (waste plus cover material) was approved on December 20, 1988 after a 2-day hearing before the Board. Angus Bruce, a resident of Storrington Township, opposed the application.

Tricil was acquired by Laidlaw Waste Systems Limited in December of 1989 and Laidlaw assumed full operational control of the Storrington site a few months later. The MOE granted an additional contour amendment in February 1990 through the issuance of an emergency Certificate of Approval that increased the site capacity by an additional 150,000 m³. On May 30, 1990, a second emergency Certificate of Approval was issued to allow the site to operate until December 31, 1990. On December 27 of that year, a third emergency Certificate was issued permitting landfilling until April 30, 1991. The site was eventually closed on April 30, 1991.

Tricil submitted the EA documentation to the MOE EA Branch in October 1989 and various Ontario government agencies reviewed the EA. The new proponent, Laidlaw, received comments from the various agencies in March 1990 and the MOE required additional studies on noise and social impact. These additional studies were submitted in August of 1990 with an Addendum document. The Addendum also addressed a number of outstanding concerns and questions raised by the review agencies. Additional agency comments were received regarding the first Addendum and a second Addendum was submitted to the MOE in March of 1991.

Public Hearing

The main hearing began on June 28, 1992 and ended on Friday November 20, 1992. The Board heard approximately 60 days of evidence, received 249 exhibits and attended several site visits. The Board would like to commend all the parties for their excellent contribution to the hearing. With very few exceptions, the parties co-operated to bring forward the best available information in an effective and efficient manner. The parties responded to the Board's direction and adversarial behaviour was minimized. Appendix B provides a more thorough commentary on the public hearing process.

PART II - ACCEPTABILITY OF THE EA

Introduction

EA Act ss. 5(3) provides a logical planning framework and a disciplined approach to solving a problem or capitalizing on an opportunity. Traditional solutions to some problems or opportunities may involve serious environmental and social impacts; the *EA Act* encourages the development of alternative solutions or opportunities that are advantageous to the current and future health of our natural environment, our communities and our economy.

Board decisions are based on a careful consideration of the purpose and provisions of the *Environmental Assessment Act*; the environmental assessment document(s); the published Ontario Government Review of the EA; other legislation relevant to the application (eg. *EP Act*, *OWR Act*); the evidence introduced by members of the general public; evidence introduced by the parties to the hearing; the submissions and arguments of the parties to the hearing; and the guidelines established by government policy and recent Board decisions.

Prior to the introduction of evidence at the main hearing, SCAT's counsel introduced a motion challenging the adequacy of the proponent's EA documentation and planning process. It alleged that the EA did not comply with ss. 5(3) of the *EA Act* and the planning standards outlined in recent Board decisions. The Board was asked to deny the application pursuant to ss. 12(2)(c) of the *EA Act*. Under this section, the Board must decide if the EA provides an "acceptable" basis for good decision-making.

The Board ruled that a fair determination of the acceptability of the EA would require the presentation and testing of evidence within the main hearing. Therefore, the motion was found premature and it was dismissed without prejudice to its reintroduction at a more appropriate stage of the hearing. Subsequent to this EA challenge, it was agreed that the EA documents and planning process would be the subject of a preliminary phase to the main hearing.

The proponent's EA documents and planning process were scrutinized by the parties and the Board during the first phase of the hearing. At the conclusion of this phase, SCAT brought a second motion challenging the acceptability of the EA.

SCAT's motion was supported by a local resident and full time party, Mr. Bruce. It was opposed by the proponent, the MOE, the Township of Storrington, the Township of Kingston and the City of Kingston. SCAT's counsel submitted that the EA had failed to meet the requirements of ss. 5(3) of the *EA Act* by failing to:

- (a) define the purpose of the undertaking broadly enough to allow a reasonable range of alternatives to be considered;
- (b) reasonably evaluate reasonable alternatives to the undertaking;
- (c) reasonably evaluate reasonable alternative methods of carrying out the undertaking; and
- (d) reasonably evaluate the "do nothing" alternative.

The Board was again asked to find the EA unacceptable pursuant to ss. 12(2)(c) of the *EA Act*. In the alternative, SCAT requested an Order limiting the further consideration of Laidlaw's application to the need (i.e. quantity and duration of landfilling) which had been proven to the satisfaction of the Board. After hearing submissions and arguments on the motion from the parties, the Board made the following findings and rulings:

- SCAT has failed to establish that the proponent's delineation and consideration of "alternatives to" and "alternative methods" was unreasonable. Given the particular circumstances, the Board concludes that the EA meets the minimum requirements of ss. 5(3) of the *EA Act*.
- The EA document and the evidence adduced during the "EA process" phase of the hearing form an adequate basis for making a decision pursuant to ss. 12(2)(c) of the *EA Act*.
- The satisfactory establishment and quantification of "need" is dependent on the quality of the EA process and the evidence adduced at the hearing. It is premature, at this point in the hearing, for the Board to make a determination regarding the quantum of the need.

This interim ruling noted that the Board's final decision would contain a more comprehensive consideration of the EA process and the issue of acceptability. The following written reasons for the Board's final decision will therefore comprehensively examine the general planning sequence outlined in the EA documents. Additional issues such as pre-submission consultation, need and reasonableness will be examined after the overall EA process has been sequentially evaluated.

Description of the Undertaking

EA Act ss. 5(3) requires a description of the undertaking. The EA Document (Exhibit 19, p. 16) describes the preferred undertaking as a 10 hectare extension to the Storrington Landfill. The extension is designed to accommodate approximately 1.4 million cubic metres of waste from the existing service area.

SCAT and the MOE criticized the proponent's EA documents for failing to provide a concise, consolidated description of the proposed undertaking (eg. leachate containment, collection and management components). The Government Review of the EA noted that the description should include: location; dimensions; approvals required; significant design features; emission controls; effluents; mitigation; monitoring; and contingency planning. The Board agrees that the EA would have been improved by a better descriptive summary.

Purpose of the Undertaking

The *EA Act* requires a description of the purpose(s) of the undertaking. The EA contains three statements of purpose (Exhibit 19, p17) that can be summarized as follows:

- to avoid waste disposal service disruption to the users of the Storrington Landfill;
- to provide for the disposal of 1,400,000 cubic metres of non-hazardous solid waste at the Storrington landfill without significant environmental impacts; and,
- to contribute to Laidlaw's business mandate of profitable waste management.

The capacity identified within the second purpose statement was also identified in the 1988 *EP Act* application for the Storrington Landfill. The *EP Act* application had been submitted to the MOE prior to the proposal's designation under the *EA Act*. The Government Review and SCAT questioned the appropriateness of specifying a site specific capacity within the EA's purpose statement. The government review comments (Exhibit 26, p8) :

The [EA] Branch recommended that it would have been more appropriate had the proponent, in using waste volume, had a more rational basis than a quantity associated with expanding the Storrington Landfill Site.

The project manager for the Kingston Waste Management Master Planning process (KWMMP), Mr. Macmillan, testified that a disposal capacity of approximately 960,000 tonnes was required to service the Kingston area's disposal needs until a Municipal site could be brought on-line in the year 2002. This tonnage equals a volume of approximately 1.4 million cubic metres, coinciding with the volume specified in the purpose statement (the opportunity for the proponent).

According to the proponent's counsel, this coincidence should alleviate any concerns regarding the rational basis for the second purpose statement. He referred to the testimony of the MOE EA co-ordinator, Mr. Bullen. Mr. Bullen concluded that the restricted consideration of the "alternatives to" was attributable to a subsequent screening exercise rather than the second purpose statement.

SCAT's counsel argued that the volume-specific purpose statement prevented the consideration of a reasonable range of alternatives. According to SCAT, the second purpose statement casts doubt on the integrity of the subsequent EA process and on the selection of the preferred undertaking. The following passage from a Joint Board decision addresses the delineation of purpose by private sector proponents (CH-87-01, "SNC", p.30):

The requirements for the description of the undertaking and the purpose of the undertaking should be consistent for private and public sector proponents.

... to accept the suggestion that the proponent's business mandate alone should determine the purpose of the undertaking could, in the Board's view, lead to such narrow definitions of purpose as to render the *EA Act* process meaningless. Municipalities would be encouraged to contract out their contentious projects to avoid the requirements of the government approvals process.

The identification of alternatives to the undertaking should be determined by the purpose of the functions of the undertaking, not by the purpose of the business aims of the private proponent.

Where alternatives have been identified, the proponent may wish to discard those alternatives which are not within its business mandate or capabilities to implement for economic reasons.

The Board accepts the rationale of the aforementioned paragraphs. The EA's second purpose raises legitimate concerns. It invites questions regarding the integrity of the subsequent EA process and the rationale for the requested disposal capacity. The inclusion of a purpose statement (eg. site-specific volume) that relates to a particular alternative could frustrate the fair consideration of a reasonable range of alternatives. This increases the risk of a successful challenge to the acceptability of the EA.

However, the Board has considered the range of alternatives considered during the subsequent EA planning process. The Board concludes that the consideration of a reasonable range of alternatives was not constrained by the second purpose statement. The primary constraint was imposed by the preliminary screening exercise.

"Alternatives to" the Undertaking

The *EA Act* requires the proponent to consider "alternatives to" the undertaking. These are functionally different alternatives that can resolve a problem (or capitalize on an opportunity) through an undertaking. The Government Review notes:

Proponents are encouraged to identify a wide range of possible alternatives that address the purpose of the undertaking and evaluate those that are considered "reasonable." It is the responsibility of the proponent to define what it considers to be a reasonable range of alternatives ...

The ability of a private sector proponent to define and rationalize what is considered to be "reasonable" is a fundamental part of preparing documentation under the *EA Act*. The inability of the proponent to consider alternatives not available (for whatever reason) has been recognized as a key element in this EA.

The proponent identified the following potential "alternatives to" the undertaking:

- Do nothing;
- 4Rs (waste reduction, recycling, recovery and reuse);
- Incineration; and,
- Landfill.

Preliminary Screening of "Alternatives to" the Undertaking

Preliminary screening criteria were used to identify the "alternatives to" the undertaking that would receive further consideration. The following screening criteria were used:

- The alternative must be capable of meeting, in an environmentally acceptable manner, the waste management needs of the users of the Storrington Landfill;
- The alternative must be potentially available to Tricil, a private sector waste management company which does not have the taxation or expropriation powers of the public sector;
- The alternative must be available by the time the Storrington site reaches capacity, which is expected to be between March 1st and June 1st, 1990; and,
- The alternative must be located within 280 kilometres of the proponent's transfer station in Kingston.

The time constraint specified in the third criterion precluded the further consideration of new (greenfield) landfill sites or incineration. Waste reduction and recovery (composting) were deemed dependent on factors beyond the proponent's control and they were also discarded.

Early Elimination of Waste Reduction & Composting

The proponent, Laidlaw, is a very significant provider of waste management services in North America. Laidlaw is proud of its pioneering role and ongoing participation in residential Blue-Box recycling efforts throughout North America. Residential Blue-Box recycling is conducted in the City and Township of Kingston through contracts with Laidlaw.

However, the proponent's counsel argued that waste reduction and diversion alternatives are beyond the proponent's direct control. He noted that the public sector defines the policies and regulatory guidelines for waste reduction and diversion through: federal packaging protocols and laws; provincial waste reduction and diversion legislation and policies; and municipal by-laws related to waste management.

Although this argument has some merit, it presents a potential dilemma for the achievement of provincial waste reduction and diversion objectives. Part of the rationale for the Storrington extension is Laidlaw's desire to support its business opportunities within the Industrial, Commercial and Institutional (ICI) waste sector of the general Kingston area.

Although Laidlaw cannot legislate waste reduction and diversion, its corporate family controls significant waste flows through disposal contracts with ICI waste generators. The public sector can legislate waste reduction and diversion. However, the public sector currently has difficulty controlling waste flow from ICI waste producers because the ICI sector is usually serviced by disposal contracts with private sector companies. A July 2, 1991 memo (Exhibit 44) from the City's Chief Administrative Officer to the Deputy City engineer alluded to this potential problem:

... and the planning of an expensive municipal recycling facility to take in and process all dry garbage should only be considered if the City and the Township will be in full control of the waste disposal from the City and the Township area after 1995.

I think Mr. L. MacMillan made it very clear that it would be uneconomical for the City and the Township to operate the M.R.F. [Municipal Recycling Facility] and composting facility if these facilities would only receive the waste collected by the municipal forces in the City and Township.

The Board notes that ICI waste accounts for a substantial proportion of the total waste generated in many urban areas. According to a Waste Composition Study prepared for the Kingston Solid Waste Steering Committee, ICI waste accounts for approximately 60% of the total waste generated in the Kingston area.

The proponent's EA acknowledges that waste reduction and diversion are desirable to reduce the environmental impacts associated with disposal. The Board received evidence on the need for modern waste management proposals to be based on innovative and aggressive waste reduction and diversion programmes and rational landfill siting methods. These considerations are fundamental to the achievement of the purpose and intent of the *EA Act*. Therefore, both public and private sector waste management EAs should seriously address waste reduction, waste diversion and rational facility siting.

According to the proponent, this undertaking requests a disposal capacity that is based on the achievement of the provincial waste diversion targets. These targets require 25% waste diversion by 1992 and 50% by the year 2000. The City and the Township of Kingston generate the majority (86%) of the waste in the Kingston area. Their witnesses testified that positive waste reduction, diversion and recycling initiatives are being undertaken. The witness statement of the Works Administrator for Kingston Township stated (Exhibit 39, pp 3-4):

The Master Plan is approximately two thirds complete. At this point in the process, a disposal system consisting of aggressive diversion to meet Ministry of Environment diversion requirements and a landfill located at one of three sites in Kingston Township have been identified as the preferred waste handling system.

With the concurrence of the Ministry of the Environment, the Township of Kingston and the City of Kingston are proceeding to implement the Waste Diversion part of the disposal system even though the Master Plan itself is not complete ...

It is currently forecast that the diversion facility will be completed by February 1995. Provided that the flow of waste can be controlled, it is anticipated that 50% of municipal solid waste can be diverted from landfill.

With regard to the landfill component of the diversion system, the most realistic estimate for the commencement of landfill is July 2000. This time frame includes a commitment on the part of the Ministry of the Environment to complete each of its reviews in 90 days.

The Township of Kingston currently participates in a Class 1 Blue Box recycling program and a leaf composting program. In addition the Township has banned grass clippings, tires and recyclable construction waste from landfill. Residential wood yard waste is processed into wood chips for use by the Township's Parks Department.

The Board acknowledges the potential benefits from these public sector waste reduction and diversion activities. However, these activities do not directly address the ICI sector which generates 60% of the waste. A private proponent should explore the cooperative development of a source separation and diversion programme, if it is seeking to satisfy a long term waste disposal need. This programme should alleviate the public sector's concern regarding flow control. It should help the ICI waste sector to attain, or preferably surpass, the province's waste reduction and diversion goals. This EA does not address the issue of waste reduction and diversion within the ICI sector.

Early Elimination of New Landfill & Incineration Capacity

The time constraint imposed by the third screening criterion was a source of debate during the presubmission consultation phase of the EA process and during the formal Government Review. Some government reviewers felt the two year time constraint was too restrictive and the purpose of the *EA Act* was not served by the immediate elimination of new (greenfield) landfill and incineration possibilities. However, the time constraint was accepted by the MOE as evidenced by the following statement from the Government Review (Exhibit 26, pp 13-14):

Due to the unique circumstances associated with this application, where the proponent was asked to prepare documentation under the *EA Act* after the proponent had identified the preferred undertaking and submitted an application under the *EP Act*, the Ministry is prepared to accept such a constraining criterion.*

The EA consultation process did not begin until the summer of 1988. SCAT's counsel argued that the third screening criterion placed a significant and unreasonable constraint on the alternatives available for consideration. If the planning horizon had been longer than two years, the range of available alternatives could have been expanded. SCAT's counsel maintained that the two-year time constraint simply targeted the Storrington extension.

* This corrected wording of the text in Government Review was provided by Mr. Bullen at the hearing.

The proponent's counsel rationalized the time constraint as follows (Volume 20, pp 47-48):

There were contracts to customers to be fulfilled. Obligations to users of the Storrington site. The users were depending on Laidlaw to provide a solution to their waste management problems.

The service area, City of Kingston, Kingston Township, Storrington, Gananoque, et cetera, had been led to believe that capacity would be available. The Proponent, as we have heard, had executed ... a good planning process, they had commenced an application under the *Environmental Protection Act*. They were going to satisfy the concerns of the users of the site, and then they were told ... to go from an *EPA* application to an Environmental Assessment application.

And the Proponent's response was, all right, we'll do that, but you have got to take into account our obligations, you've got to take into account that we've got to get the site operational within a fairly short period of time. So that is why [the time constraint in the preliminary screening exercise] was used. And in the circumstances, in my respectful submission, Mr. Chairman, that is not unreasonable.

It would be unreasonable if there had been poor planning, but there had been good planning by the Proponent but there was shift from the *EP Act* to the *EA Act* after the Proponent had filed the *EP Act* application.

The proponent's counsel also cited the limitations of a private sector proponent. The public sector has the ability to expropriate properties to gain access during a landfill siting process (i.e. greenfield). The public sector also has access to taxation whereas the private sector must respond more directly to market forces (eg. maintaining profitability). The early elimination of new landfill and incineration capacities was partially attributed to these constraints.

Witnesses for the City of Kingston and the Township of Kingston testified that the expropriation process is not a simple or fast path for gaining access to properties during the search for a new landfill site. The Kingston Area Waste Management Master Plan (KWMMMP) has made very slow progress over the last six years.

The consultant for the KWMMMP predicted that it would take another decade before the municipal EA process could produce a new municipal disposal facility. In contrast, only two years were allocated to the private sector EA designed to meet the interim disposal needs of the City and

the Township. Given this context, the two year time constraint was understandably questioned by the residents near the proposed Storrington Landfill extension.

The Government Review recognized the limitations inherent to the private sector during their evaluation of this EA. The different constraints and potentials of private and public sector proponents are relevant to the Board's determination of reasonableness. However, the Board also recognizes that it would be unfair to place public sector proponents at a disadvantage by condoning private sector EA's that do not satisfy the requirements of the *EA Act*.

The differences between private and public sector proponents should not result in an application of the *EA Act* that compromises the *Act's* purpose of protecting and conserving community, environmental, and resource values. Private sector waste management companies should not rely on expectations that they can avoid the high standards of environmental planning and protection that are required to protect the public interest and fulfil the purpose of the *EA Act*.

The Board shares the concerns of SCAT and some of the Government reviewers regarding the early elimination of the alternatives of new (greenfield) landfill, waste reduction and some waste diversion opportunities. The serious consideration of these alternatives is important to the selection of a preferred undertaking that is consistent with the purpose and provisions of the *EA Act*. However, the Board has also considered: the proponent's designation under the *EA Act* after the completion of three years of planning under the *EP Act*; the MOE's apparent acceptance of the time constraint imposed during the preliminary screening exercise; and the factoring of the provincial waste reduction and diversion targets into the premise for need. The Board concludes that the early elimination of certain "alternatives to" does not fatally flaw this EA.

Criteria for further evaluating Alternatives

The alternatives that survived the preliminary screening exercise were: do nothing; Storrington Landfill extension and recycling; and existing landfill capacity combined with recycling. These remaining alternatives were further evaluated utilizing the following general criteria: human health impact; natural environment impact; social environment impact; cultural environment impact; and economic environment impact.

The Government Review provides the following comments regarding the evaluation criteria (Exhibit 26, pp. 13-14):

Evaluation criteria are a fundamental component of environmental assessment. Criteria are instrumental in providing for 'evaluations' of the advantages and disadvantages of each alternative, pursuant to ss. 5(3)(d) of the Act. Where possible, the same set of criteria should be used as the framework for the entire evaluation process and the level of detail should increase as the planning process progresses. The criteria should be clearly defined to provide for a traceable and replicable process.

.... The evaluation criteria were found to be poorly defined. For example, from the criterion "Natural Environmental Impact," in Section 4.3.1, it is not clear what components of the natural environment were considered. During PSC the proponent was advised to clearly define all screening and evaluation criteria.

The Board agrees with this observation. The Board also believes that the EA does not properly document the impact of public interests and ecological principles on the choice and application of the criteria. Evaluation criteria should be designed to integrate public interests and ecological principles into the EA process. Meaningful public and agency involvement helps to achieve this integration.

Six Step Screening Process

The remaining alternatives were further screened utilizing the aforementioned evaluation criteria and the following six step procedure: 1 - each alternative was described; 2 - the environment potentially affected by each alternative was briefly described; 3 - potential effects, mitigation and remaining net effects were identified; 4 - based on the net effects, the advantages and disadvantages of each alternative were listed; 5 - based on advantages and disadvantages, alternatives were either eliminated or carried forward for further consideration; and 6 - the rationale for the elimination or retention of an alternative was stated.

After the application of the five categories of evaluation criteria through the six step screening process, the proponent discarded the "do nothing" alternative. The alternatives of existing capacity, the Storrington extension, and recycling were retained for further consideration.

Early Elimination of the "do nothing" Alternative

The proponent discarded the "do nothing" alternative for the following reasons: it would not fulfil the EA purpose of avoiding service disruption to the users of the Storrington landfill; it would not contribute to another purpose of the EA - the proponent's desire to service its waste disposal contracts and conduct a profitable waste management business; and, it involves a number of potential natural environment and health impacts.

The EA Coordinator for the MOE noted that the "do nothing" alternative should have been retained for further reference. The Government Review comments (Exhibit 9, p.11) :

The 'do nothing' alternative must be included; this alternative represents a "benchmark" from which all other alternatives are evaluated. This alternative assists the Minister or the EA Board in deciding whether or not the undertaking should be approved.

SCAT's counsel submitted, and the Board agrees, that the EA document contains a cursory analysis of the "do nothing" alternative. The EA Branch did not require the proponent to remedy this apparent weakness in the EA prior to the preparation of the Government Review. However, the hearing evidence provided the Board with a reasonable understanding of the relative merits and potential impacts of the "do nothing" alternative.

The 1991 closure of the Storrington Landfill provided empirical evidence on the probable result of the "do nothing" alternative. Kingston area waste has been trucked from the local transfer station to the Regional Municipality of Ottawa-Carleton (RMOC) Landfill since the Storrington site closed.

Thus, the "do nothing" alternative results in the long distance hauling of waste to a jurisdiction outside the general Kingston area. This exportation of waste has almost doubled the Kingston area's disposal cost and it is reducing disposal capacity in the Ottawa Carleton Region. The high disposal cost has stimulated a heightened commitment to waste reduction and diversion (eg. bans on the receipt of certain waste at the transfer station) in the Kingston area. However, the additional cost of exporting waste has also imposed a greater financial burden on Kingston area taxpayers and businesses.

The Board acknowledges that significant environmental, economic and social repercussions are associated with the long distance transportation of large quantities of waste. Fossil fuel consumption increases as the hauling distance increases. This combustion of fossil fuels contributes to acid rain, global warming and reduced ambient air quality. The usual reliance on heavy truck transport also contributes to higher vehicle and highway maintenance costs.

Prolonged exportation also tends to isolate the populace that generates the waste from the non-monetary impacts of prolific waste generation. This separation of cause (i.e. prolific waste generation) and effect (i.e. environmental and community disruption, resource and energy waste) can reduce the motivation for timely progress towards better waste management (eg. waste reduction and diversion).

Policies and laws regarding the exporting of non-hazardous waste are rapidly evolving in many jurisdictions. Some jurisdictions in the United States and Canada already have, or are contemplating, a ban on domestic waste importation. If these changes occur rapidly, then the exporting jurisdiction may have difficulty finding other competitive and environmentally acceptable disposal capacity. This factor reduces the exporting jurisdiction's security of price and service.

The aforementioned disadvantages to the "do nothing" alternative were raised at the hearing. They were not thoroughly addressed in the EA document. The Board agrees with SCAT and the Government Review - the EA documentation should have retained the "do nothing" alternative throughout the EA selection process as a benchmark.

The hearing evidence supported the proponent's contention that the "do nothing" alternative would promote the continuation of crisis waste management and waste exportation. MOE policy guidelines and recent Board decisions note the importance of the "do nothing" alternative as a benchmark for the evaluations of the decision maker. The probability that an EA will be found acceptable is increased by adherence to these guidelines. However, in this case, the Board concludes that the proponent's abbreviated consideration of the "do nothing" alternative did not violate the provisions and purpose of the *EA Act*.

Alternative Methods

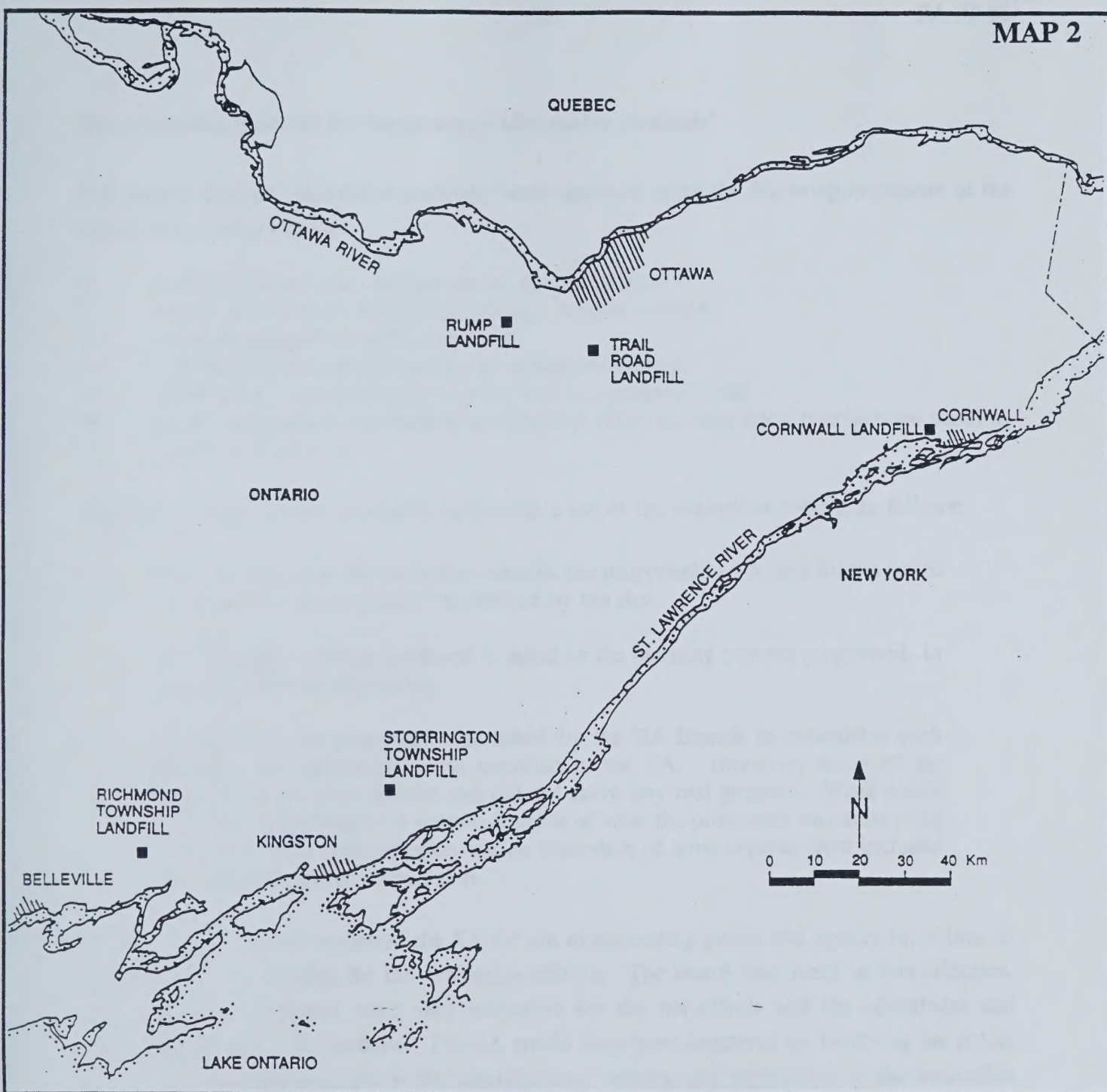
The screening exercises for the "alternatives to" resulted in the further consideration of landfill capacity and/or recycling. Other functionally different "alternatives to" were eliminated from further consideration. The EA then considered the following two "alternative methods" of achieving the purpose of the undertaking: the extension of the Storrington landfill and recycling; and existing landfill capacity at another location and recycling.

According to the EA, existing landfill capacity in Quebec was unavailable due to a 1988 ban by the Quebec government on the importation of domestic waste. Capacity within New York state was also unavailable. The USA Department of Agriculture prohibits domestic solid waste importation for purposes other than incineration. The proponent's EA co-ordinator, Mr. MacDonald, testified that he surveyed available capacity within a 280 kilometre radius of Kingston. He reviewed the MOE's Waste Disposal Site Inventory (May, 1988) and checked with district MOE officials to identify potential capacity.

The four preliminary screening criteria that were used to select the "alternatives to" were also used to identify suitable landfill capacity. The proponent identified the following landfill sites as satisfying the preliminary screening criteria: Richmond Township (owned by the Tricil); Trail Road (owned by the Regional Municipality of Ottawa-Carleton); Rump Landfill (owned by Laidlaw); and the City of Cornwall (owned by the City of Cornwall). The location of these 5 landfill sites is illustrated in Map 2. According to the EA, other sites were eliminated because MOE officials informed the proponent that they did not have sufficient capacity (i.e. 1.368 million cubic metres over ten years).

The Richmond Landfill was considered separately from the other three sites due to its comparative proximity to Kingston and its ownership by the proponent. The other three landfills were considered as a combined (Tri-site) alternative that could be used together or in sequence. The identified alternative methods were: extend Storrington; utilize Richmond Landfill; or divide the waste among the Trail Road, Rump and Cornwall Landfills (Tri-site). The service area, remaining capacity, annual use and tipping fees for these landfills are summarized in Appendix C.

MAP 2



**LOCATION OF RICHMOND, STORRINGTON, TRAIL ROAD,
RUMP AND CORNWALL LANDFILLS**

More Detailed Criteria for Evaluating "Alternative Methods"

The three identified "alternative methods" were screened using the following expansion of the earlier evaluation criteria:

- health (ground water, surface water, air emissions);
- natural environment (terrestrial ecology, aquatic ecology);
- social environment (traffic, land use);
- cultural environment (proximity to cultural resources);
- economic environment (cost to user, cost to proponent); and
- waste management environment (availability, effect on other waste management planning processes, capacity).

The Government Review comments on the EA's use of the evaluation criteria as follows:

Through the use of the evaluation criteria, the proponent had regard for the entire scope of the "environment," as defined by the *Act*.

The evaluation criteria increased in detail as the planning process progressed, in keeping with Ministry policy.

During PSC, the proponent was asked by the EA Branch to rationalize each criterion; this information was provided in the EA. However, many of the rationalizations were generic and did not serve any real purpose. What would have been more helpful is some indication of what the proponent was attempting to measure with each criterion and an indication of what criteria were included as a result of public consultation.

SCAT's EA consultant criticized the EA for not incorporating public and agency input into an objective priority ranking for the evaluation criteria. The Board sees merit in this criticism. The proponent's analyses were very subjective for the net effects and the advantages and disadvantages of the alternatives. The EA would have been improved by involving the public and the government agencies in the identification, ranking and application of the evaluation criteria.

Screening of Alternative Methods

The further evaluation and screening of the three alternative methods utilized the previously described six step screening process. After the assessment of advantages and disadvantages for each alternative method, the Tri-Site alternative was eliminated. The reasons for its elimination can be summarized as follows:

- Waste capacity at the Tri-Site landfills may be denied at some future date due to the other needs of the owners. Therefore, unlike the Storrington and Richmond landfills, the availability of waste management service is uncertain for the Tri-Site alternative. NB: At the time of this evaluation the Rump landfill was not owned by Tricil, the then proponent. Tricil was subsequently purchased by Laidlaw in December 1989;
- The Trail Road and Cornwall Landfills would require an amendment to their service areas to provide access for Kingston area waste disposal. The Richmond site would require an amendment to its annual tonnage limit...
- The EA document reports that under existing MOE policy separate EAs would have to be conducted to accomplish these amendments. There was insufficient time to conduct the necessary environmental assessment before the Storrington landfill reached capacity in 1990;
- The greater transportation distances associated with the Tri-Site alternative would have greater traffic impacts upon the natural and social environment;
- The Tri-Site alternative would increase user-costs due to the higher transportation costs and higher out-of-jurisdiction tipping fees for both the Rump and Trail Road landfills; and,
- The Tri-Site alternative offers less financial benefit to the proponent than either the Storrington or Richmond sites because the proponent does not own all the landfill capacity.

The Government Review commented on the screening of the alternative methods as follows:

Throughout the site selection process, it remained unclear on what basis the Rump landfill site (then owned by the proponent's competition - Laidlaw) was considered and rejected.

After the formal submission of the EA to the Minister of the Environment, on October 4, 1989, Laidlaw purchased Tricil. Through this acquisition, the proponent now retained ownership of the Rump (West Carleton) Landfill Site...

In response, there were renewed comments for Laidlaw to consider the Rump landfill as a serious option to Storrington: the Rump landfill has an "unlimited service area" with a considerable amount of approved capacity.

This issue was addressed on page 16 of the Addendum-1 report: the proponent concluded that the Rump landfill site should remain excluded at this stage due to the effects on the natural, social and economic environments.

Appendix C supports the availability of considerable capacity at the Rump and Cornwall Landfills. However, these landfills are located in other jurisdictions that are more than 150 kilometres from Kingston. The Board believes that the long distance transportation of non-hazardous waste is a short term solution to a long term problem. It temporarily transfers the potential social and environmental impacts of waste disposal from one area to another. Therefore, the Board cannot conclude that the proponent's elimination of the Tri-Site alternative was unreasonable.

After the elimination of the Tri-Site alternative, the Storrington and Richmond sites were carried forward for more detailed evaluation.

Selection of the Preferred Alternative Method

The remaining two alternatives (Storrington and Richmond) were subjected to a comparative evaluation. An expanded list of 29 evaluation criteria was identified. These criteria were grouped under the previously used evaluation categories and one additional category. The categories and evaluation criteria included:

- health (ground water, surface water, natural watercourses, drainage ditches and air);
- natural environment (terrestrial ecology, aquatic ecology, floodplain, mineral resources, forest resources and agricultural soils);

- social environment (displacement of community resources, proximity to residential development, proximity to community resources, traffic, land-use, nuisance, visual impacts, odour and noise);
- cultural environment (heritage resources and archaeological resources);
- economic environment (cost to users and cost to proponent); and,
- waste management environment (availability, effect on other waste management planning processes and capacity).

The area surrounding each site was studied for a distance of 2 kilometres. The residual impacts that would remain after mitigation were identified as net effects. The differences in net effects were translated into comparative advantages and disadvantages for each site and the following deciding factors were identified:

Social Environment	• fewer community resource impacts and traffic impacts with Storrington, but agricultural land will be lost;
Economic Environment	• shorter travel distance to Storrington results in lower cost to users; • greater financial benefit to proponent with Storrington due to creation of additional revenue-earning waste disposal capacity;
Waste Management Environment	• utilizing Storrington would increase landfill capacity in the province by 1,368,000 m³; • utilizing Richmond would diminish by half the available capacity at that site; • utilizing Richmond would disrupt the waste management planning process under way in Centre and South Hastings by reducing local landfill capacity; • by providing more landfill capacity, Storrington would benefit the local master plan process under way by allowing more time for completion of that process.

Based on the comparison of advantages and disadvantages, the proponent chose the Storrington Landfill extension as the preferred alternative. The preferred alternative was also described to include: recycling of white metal, as presently done; operation of a blue box recycling programme by the proponent through contracts with the City of Kingston and the Township of

Kingston; provision of Recycling Bins for those who wish to separate recyclable wastes before disposal; Investigation of the feasibility of leaf composting and tire recycling.

SCAT highlighted several weaknesses in the process used to select the preferred alternative. Some of the issues raised by SCAT are also referred to in the following excerpts from the Government Review (Exhibit 23, p29):

Since the methodology (including criteria) were refined over draft EA's three and four, the public were not granted any opportunity for review and input. The proponent only consulted with the public on drafts one and two.

The proponent's identification of advantages and disadvantages, in some cases, is unbalanced. For example, in the evaluation of the Storrington and Richmond landfill sites, no reference is made to an advantage to the local residents if Storrington were not expanded.

...the proponent described many of the net effects with subjective terms such as 'negative', 'no impact' etc. As a result, the advantages and disadvantages were equally subjective. It would have been more beneficial had the proponent quantified the net effects to provide some indication of magnitude.

The Board agrees with these conclusions. After reviewing the EA and visiting both sites, the Board would not necessarily conclude that the Storrington extension involves fewer environmental and community impacts. The Richmond site is an active landfill with approved capacity. It is set-back a few hundred metres from a wide paved County Road to the west and a recently paved Beechwood Road to the south. These setbacks considerably reduce the site's visual impact from the roads and the potential for public exposure to off-site nuisance impacts. The Board recognizes the existence of a small rural church within a few hundred metres of the Richmond site. However, this factor should not overwhelm the evaluation of overall community impacts.

Although the Storrington site was operational at the time of the EA, it is now a closed, capped and revegetated mound. The local community is becoming accustomed to this situation. The proposed Storrington extension would be setback less than 50 metres from the narrow gravel Washburn Road to the south and the narrow Johnson Sideroad to the east. This proximity to small rural right-of-ways increases the potential visual impact and the potential for off-site nuisance impacts (eg. noise, litter, dust, traffic, visual impact, rodents, runoff).

These nuisance impacts would be felt by the pedestrians, bicyclists, farm vehicle operators and local motorists that regularly use the Washburn Road and Johnson Sideroad. In addition, the Storrington Landfill site is visible from the nearby Rideau Canal, a popular waterway for recreation and tourism. The proponent owns substantial buffer lands to the east of the Johnson Sideroad and to the south of Washburn Road. However, these buffer lands do not insulate the aforementioned public from potential off-site impacts.

The comparative evaluation of potential natural environment impacts was also poor. The Storrington site has: a provincially significant Class 2 wetland approximately 120 metres to the east of the Johnson Sideroad; a class 7 wetland less than fifty metres south of Washburn Road; the Cataraqui River (Rideau Canal) less than 300 metres to the east; and a small stream originating at a groundwater discharge area just south of the Washburn Road.

The EA did not adequately survey these natural environment features or seriously evaluate the potential for ecological impacts. Although the Richmond site has a small stream to the north of the site, the potential impacts to the natural environment at the Storrington site appear to be greater. The Board cannot totally fault the proponent for the poor natural environment evaluation.

The MNR and the Cataraqui Conservation Authority participated in the presubmission consultation process in 1988/89. These public agencies have a mandate to protect and wisely manage natural resources. However, the Board is not aware of any evidence that these agencies advocated the need for a thorough ecological survey and impact analyses. Apparently, the MNR's knowledge of the Storrington area's wetland resources was superficial during the EA process. In fact, the two wetlands were not surveyed and classified until the late spring of 1990 and the classifications were based on a single site visit.

The MNR and the Cataraqui Conservation Authority did not appear at the hearing to represent the public mandates entrusted to them. The Board believes the EA process would have benefited from a more proactive involvement of these agencies.

The Richmond site is located a few minutes drive north of Highway 401 approximately 50 kilometres west of Kingston. There are only a few houses along the relatively wide paved roads that lead to the Richmond site. In contrast, the access route to the Storrington site passes many houses along Highway 15 and County Road 12 before turning onto the very narrow, gravel Johnson Sideroad. Therefore, the Board also has doubts about the conclusions of the proponent's comparative analysis of potential traffic impacts.

The EA's analyses of the advantages and disadvantages of the alternatives is subjective. The Board believes that the EA gravitated towards two dominant concerns; the desire to maximize financial benefits to the proponent, and, the desire to minimize the costs to the users (eg. the City and Township of Kingston). These legitimate concerns have dollar values that are easily factored into the selection process. However, a good EA process will also integrate important environmental and social costs into the decision making process.

The Board acknowledges that a course of action which seems reasonable near the beginning of an EA planning process may be deemed less reasonable at the end (eg. incineration). However, a pro-active proponent and EA Coordinator will effectively internalize social and environmental costs within the EA decision-making process. This pro-active approach helps to: anticipate trends; gauge potential mitigation costs of various alternatives; and build in appropriate contingencies. The current EA appears to have followed a traditional engineering analysis that emphasizes monetary costs and benefits. This traditional approach is less sensitive to evolving knowledge and attitudes regarding social and environmental costs. Therefore, the traditional approach has less foresight.

The proponent's counsel acknowledged that the EA had some weaknesses. However, he argued that it was consistent with prevailing MOE expectations in 1989. He noted a statement by the Minister of the Environment in Appendix D of the MOE's *Interim Guidelines on Environmental Assessment: Planning and Approvals* (July 1989). This statement outlined the following expectations regarding private sector energy-from-waste EAs:

.... proponents are entitled to determine what is reasonable for their planning process and to decide among equally acceptable alternatives. ...

Private sector proponents will only be required to consider those sites that are reasonable and reasonably available, given the nature of the proposed undertaking. In many cases, the siting alternatives of a given private sector proposal may be narrowed because of the location of a selected customer, sources of raw materials, availability of sites, or a required distribution system ...

The *Act* requires a reasonable planning effort, taking into consideration the proponent's nature, aims, resources and capabilities. Provided a reasonable planning effort is made, the Ministry will support a document as meeting the requirements of the Act, whether the decision is made by the Minister or a hearing Board.

Pre Submission Consultation

Participation in the EA was initially solicited during the summer of 1988. Participation was invited with a widely distributed letter and published public notices. Beginning in the fall of 1988, the proponent advertised and hosted a number of "public workshops" to obtain input on the draft EA documentation. The EA summarizes the following major issues that were raised by the public in the early meetings:

- a concern about the possibility of a future expansion of the site onto the "Campbell property";
- the desire for a commitment from Tricil that further expansions would not occur after the present EA extension;
- a concern that the site may become a "regional landfill site";
- the potential contamination of surface and groundwater;
- the need to monitor water quality in surrounding domestic wells;
- the effectiveness of the proposed treatment of leachate through a constructed marsh channel;
- the desire for assurances that the landfilling of hazardous waste would not be permitted;
- the need to prevent garbage from falling off trucks;

- the need to prevent Landfill litter from blowing onto neighbouring properties;
- the need for good operational standards of the site;
- the potential decline of local property values; and
- the post closure monitoring and maintenance of the site.

The Government Review notes that the public was given an opportunity to review draft EA documents on at least four separate occasions. It concludes that public consultation was integrated into the planning process. However, the following weaknesses in the proponent's consultation process were noted (Exhibit 26, pp. 4-5):

... the public and government review team (with the exception of the EA Branch) were not given an opportunity to review draft EA documents three and four. Both the evaluation methodology and new evaluation criteria were proposed and refined in these latter drafts.

The Ministry encourages proponents to allow for the review and to receive input on both the evaluation methodology and criteria. Had a review occurred, this may have prevented the preparation of Addendum documentation.

... reference to public input and how this influenced the planning process was absent throughout the EA document. This is a fundamental requirement of environmental assessment and one that was not addressed.

... issues identified as concerns by the local public, during PSC, were not fully addressed in the documentation. ...

During the early stages of the PSC, a variety of personnel represented the MOE. Mr. Bullen was not assigned as the MOE's "EA Advisor" until the spring of 1989. Two community participants in the EA process, Ms. Fletcher and Ms. Vivian, testified that the EA process was never properly explained to them. They entered the EA process with an expectation that the MOE would: help the public to understand and contribute to the process; provide an independent and understandable evaluation of complex technical matters; and ensure that legitimate concerns were addressed during the selection process and the design of the preferred undertaking. Another expectation was that the public would have ready access to the documents related to the application. These seemingly reasonable expectations were not satisfied.

Ms. Vivian and Ms. Fletcher shared the impression that most of the important EA decisions, including the selection of the preferred alternative, had been made prior to public involvement. According to Ms. Fletcher, the alternatives to waste disposal (eg. reduction and diversion) were not thoroughly examined. The witness statement (Exhibit 51) and evidence of Ms. Vivian included the following comments on the EA process:

Specifically we were rushed through "public consultation" on the basis that the site was filling up fast and a short-term site was required. Alternatives were not fully required to be investigated because of the immediate urgency of the site becoming full and because it was a short term lifespan, that is until the final document became available - after it was submitted to the MOE - and it had changed into a long-term proposal!

... if we brought up a process problem, an engineering, or a hydrogeological problem, we didn't have any experts on board to help us to know whether the proponent's answers were right or wrong. Also the proponent didn't look at the problem, rather they left the problem ... to be reviewed at the time of the hearing. Only now, as I understand it, are these problems being looked at by Laidlaw with new resolutions coming to the hearing with absolutely no prior consultation. (Exhibit 51)

Maybe if [the proponent] had worked with us four years ago, we wouldn't be here tonight. We'd have saved the taxpayer a lot of money. We'd have saved ourselves a lot of money. But you know something, I'm glad [the proponent] didn't capitulate then, because I was naive four years ago. I thought [the proponent] ... knew how to run landfill sites. ... I know they don't now. And I'm glad to know that, because I'll question every Ministry that I ever come across, be it federal, provincial or municipal. And for that, I thank you. (Volume 27, pp 145-146)

The public consultation was effectively terminated prior to the assignment of the "EA Advisor" and prior to the preparation of EA drafts three and four. Ms Fletcher testified that several months after the public consultation began:

... in March 89... . Mr. MacDonald announced that he felt we had reached an impasse and that nothing further could be resolved and that we were taking up a lot of time and that they had to get their application in to keep the site operating. But the impasse was strictly on their side. It was their decision.

Once the EA workshops were terminated a public liaison committee continued to meet occasionally. This committee dealt primarily with public concerns regarding the ongoing operation of the site and the applications for emergency contour amendments. The public found the coincidental evaluation of the contour amendment applications and the EA application very confusing. The applications for emergency contour amendments were designed to keep the site open until a decision on the EA extension was rendered.

The proponent's counsel questioned Ms. Fletcher regarding the community's primary concerns with the proposed undertaking. Ms. Fletcher agreed that her primary concern was the need to prevent off-site impacts to the environment and the community. Ms. Fletcher was asked whether SCAT's opposition would be withdrawn, if SCAT's hydrogeologist was convinced that the proposal was environmentally sound. She replied:

I can't say we would totally withdraw our opposition because we have other concerns ... about ... property value and about compensation for nuisance impacts.

And I believe that we would want to have tighter controls on site operations than we've had in the past. I would say the biggest concern is the pollution concern, but I can't say we would pull out of the hearing and remove our opposition unless these other concerns are addressed.

The Ministry's *Guidelines and Policy on Pre-Submission Consultation in the EA Process (PSC Guidelines)* were released in November of 1987, several months prior to the commencement of this EA. According to Mr. Bullen, these guidelines were based on the MOE's experience and the guidance provided by EA Board decisions.

The *PSC Guidelines* encourage proponents to: identify affected individuals, groups and government organizations; provide these parties with information; explain proposed planning activities and decision-making processes; seek ongoing input; and modify the preferred undertaking as necessary to address the concerns before proceeding. Mr. Bullen's witness statement further notes (Exhibit 49, p. 5):

Pre-submission consultation is not a separate procedure conducted parallel to or after a planning process. The input of the affected parties is an integral part of the planning process and begins at the earliest stages.

Ms. Fletcher suggested the following ways of facilitating public participation in the presubmission consultation process:

I think there should be an independent party designated to inform the public about what levels of participation they can have in the environmental assessment so that they're clear at the outset what they can be involved in ...

I think there should be some technical person present to represent the general public and interpret in an unbiased way some of the technical data ...

The Board has observed the public's reluctance to accept the conclusions of experts and consultants that are hired by the proponent. Public participants want earlier access to independent expertise to evaluate the potential impact of the undertaking on their interests. Traditionally, intervenor funding has been made available late in the EA process at Board hearings. However, proponents do have the option of providing much earlier funding. Early funding could lead to more constructive input from groups representing broad public interests. Some of the potential advantages of this approach are:

- Effective public intervention from the early EA planning stages onward should help to achieve the purpose of the *EA Act* by directing the EA on the most environmentally and socially acceptable path - a path that is less likely to end up in a lengthy hearing or a costly dead end;
- Undertakings that are fundamentally at odds with the public interest can be weeded out before too much time and money are spent;
- If the public involvement is well-documented in the EA, then the MOE review should be shortened and a public hearing may not be required; and
- If a hearing is required, the earlier facilitation of public involvement should reduce; the need for intervenor funding, the preparation time before the hearing, and the length of the hearing.

Both SCAT and the government review were critical of the proponent's presubmission consultation process. The Board believes the public should have been afforded an opportunity to have input on EA drafts three and four. The additional time required for circulation does not justify the failure to do so.

SCAT argued that early and ongoing public consultation is essential to the fulfilment of the spirit and intent of the *EA Act*. They noted the *PSC Guidelines* and suggested that the proponent has a responsibility to document the influence of public input on the selection and application of the screening criteria. EA Board decisions have strongly supported the importance of meaningful public consultation during the development and application of the criteria used to evaluate the alternatives and select the preferred undertaking. Although meaningful public consultation does take time, it provides an opportunity for a progressive proponent to benefit from local knowledge and address contentious issues.

The Board heard numerous concerns from the Storrington community and visited the Landfill site on several occasions. The Board has concluded that the majority of the concerns expressed by the local community were, and are, legitimate and reasonable. A good public consultation process would have dealt with these concerns. However, the subject EA did not fully address these concerns and the initial community resistance eventually hardened into rejection of the undertaking. The result was a very costly EA hearing that may have been avoided by an early investment in public consultation and a tangible commitment to effectively address public and environmental concerns.

The EA does not document the contribution of public consultation to the evolution of the EA process and the choice of the preferred alternative. Therefore, the existence of a "meaningful" public consultation process is not evident. An early and ongoing investment in meaningful public participation would have directed the EA on a more environmentally and socially acceptable path that would have been less likely to require a lengthy MOE Review and a hearing. In the context of a hearing, a thorough and meaningful public consultation process would have allowed the EA to withstand the scrutiny of the hearing without the need for additional ground water sampling, costly last-minute revisions to the undertaking and associated delays.

The proponent's counsel agreed that presubmission consultation and public participation have become basic requirements of the EA process. However, the Board was asked to judge the proponent's public consultation process in the context of the consultation standards of 1988/89 and the unusual requirement for a rapid shift from the *EP Act* mode to the *EA Act* mode. He asserted that the proponent's PSC program was clearly adequate under the prevailing circumstances.

The Board is satisfied that the PSC program adequately identified and solicited the participation of the potentially interested parties. The evidence also indicates that the proponent eventually addressed (eg. addendum reports) most of the concerns of the interested government agencies. The major weakness in the proponent's PSC was the public involvement component.

The expectations regarding public consultation are increasing. The Board also recognizes that the EA process would have benefited from a consistent MOE presence and better guidance, particularly during the early stages. This EA involved the additional complication of a private proposal designated under the *EA Act* after the submission of an *EP Act* application. Under the extenuating circumstances, the Board concludes that the weaknesses in the proponent's public consultation process do not fatally flaw the EA.

Need for the Undertaking

The proponent's description of the need for the undertaking can be summarized as follows (Exhibit 19, pp. 17-8):

- The users of the Storrington site do not have alternative waste management services available after the existing site reaches capacity in 1990;
- The major users of the site, the City of Kingston and the Township of Kingston, have a need (interim) between 1990 and the predicted development of alternate waste disposal capacity through the completion of the KWMMP in 1996;
- Other Kingston area users of the site, such as Storrington Township, are not participating in a process to find alternate waste management services (eg. KWMMP) and therefore they may have a need (long term) for disposal that extends beyond the completion of the KWMMP;
- The KWMMP may not be completed by 1996 or, if completed, the KWMMP may require partial use of landfill capacity at the Storrington site after 1996. Therefore, the City and Township of Kingston may have a longer term need; and
- Landfill disposal capacity is needed by the company to operate its waste management services and generate net revenue for its share-holders.

The Board's evaluation of need will be divided into two components. The first component evaluates the requirement for landfill disposal capacity after considering the other feasible "*alternatives to*". The second component of need will evaluate the proposed solution (i.e. preferred alternative) in relation to the established size and duration of the problem. These components of need will be addressed with the purpose of the *EA Act* in mind.

Volume versus Weight and Time Period Based Approval

SCAT initially raised the issue of whether need should be considered in terms of quantity and time period. The Board subsequently asked whether need should be characterized in terms of tonnage and time period rather than volume. The Board's rationale for this question was:

- the projections of waste requiring disposal (need) were based on weight and time period rather than volume;
- the weight (tonnage) of waste is the proposed unit of measurement at both the transfer station and the landfill site;
- the landfill volume consumed per unit weight (tonnage) of garbage can vary greatly depending on the composition of the material, the compaction force applied and the amount of daily cover used;
- the potential for adverse environmental and social impacts (eg. refuse truck traffic, leachate and gas generation) appears to be more directly correlated to the weight of the disposed waste than the volume of the landfill; and,
- the potential for social and environmental impacts is correlated to both the rate of disposal and the length of the disposal period.

The proponent and the MOE indicated that a volume-based (i.e. cubic metres) approval would be easier to design and regulate by ongoing monitoring of the landfill contours. However, the engineering consultants for SCAT indicated that a landfill could be readily designed and monitored to accommodate a tonnage based approval. After considering the arguments of the various parties, the Board believes that any approval would be stipulated in terms of a maximum allowable tonnage and disposal period.

Need for Landfill Disposal Capacity

The Government Review accepts the proponent's establishment of the need for other landfill capacity until the Kingston Area Waste Management Master Plan is completed and a new Municipal landfill is operational. A consultant for the Kingston Area Waste Management Master Plan (KWMMP) supported this conclusion. After assuming that the provincial targets for waste reduction and diversion would be achieved, he concluded that significant amounts of residual waste would require landfill disposal.

SCAT's counsel argued that the first component of need was not convincingly demonstrated due to the proponent's cursory treatment of the "do nothing" alternative. However, the Board considered the "do nothing" alternative earlier in this decision. The Board concluded that the "do nothing" alternative promotes the undesirable continuation of crisis waste management and waste exportation. After considering the evidence of the KWMMP consultant and the probable result of the "do nothing" alternative, the Board is satisfied that the first component of need has been reasonably demonstrated.

Duration of Need (Disposal Period)

The second component of need requires a more detailed evaluation of the waste management problem within the Kingston area in relation to the solution proposed by the proponent. Mr. Stefan, Works Administrator for the Township of Kingston, provided evidence on the history of Kingston Township's search for waste disposal capacity. In 1978, the Township's MacAdoo Lane landfill was approaching capacity. Although the Township initiated a search for an alternative in 1978, they were still relying on the MacAdoo Lane site in 1987. Environmental concerns existed regarding the prolonged use of the MacAdoo Lane site. SCAT asked whether the MOE had to force the closure of the site in 1987. Mr. Stefan responded: "Well that and the law of gravity. We could only pile so high ... it was an old landfill".

Once the MacAdoo site closed, the Township began disposing of its waste at the Storrington site. This resulted in a disposal fee increase from approximately \$8/tonne to approximately \$35/tonne. The City of Kingston had already been using the Storrington site for over a decade. In 1987, the City of Kingston joined the Township's ongoing search for suitable waste management options. Their joint planning effort (the "KWMMP") qualified for an MOE subsidy (50%).

SCAT obtained several memos written by Mr. Stefan regarding the deliberations of the steering committee for the KWMMP. A memorandum dated February 1988 (Exhibit 31) reports that a Tricil representative told the committee that Tricil was well-positioned to extend the waste disposal contracts of the Township and City of Kingston beyond 1995. A committee member questioned the impact of the extension of Tricil's Storrington landfill on the establishment of need for the future Municipal landfill. The general question was: If the City and The Township support the Storrington extension and the Storrington site has excess capacity at the time the Municipal Landfill EA application is being brought forward, how will this affect the viability of the Municipal Landfill application? Mr. Stefan's memo also raised another question regarding the need to complete phase 2 of the KWMMP, if a viable alternative would be available.

The draft phase 2 KWMMP document had been released by 1988. This document identified a potential mixture of alternatives to landfilling and several potential locations for a new municipal landfill. Although the imminent release of the revised phase 2 document was expected in 1988, it had not been released by June of 1992. The KWMMP appears to have stalled at phase 2.

SCAT noted several important facts: the Storrington Landfill operator made overtures to the City and Township of Kingston in 1988 regarding the extension of waste disposal capacity at the Storrington Landfill; the proposed Storrington Landfill extension is not within the jurisdiction of either the City or the Township of Kingston; the location of the potential KWMMP landfill sites are within the Township of Kingston; the siting of a new landfill facility is often a very contentious political issue; and, locating a new landfill in the Township of Kingston would require strong political will. SCAT blamed the ongoing reliance on the Storrington Landfill and the absence of political will for the stalling of the KWMMP.

The witnesses for the City and Township provided several other reasons for their slow progress, including; inexperience with regard to the complex EA and WMMP process; the absence of reliable and timely guidance from the MOE regarding the acceptability of alternatives (eg. quarry and incineration options); evolving MOE, Board and public expectations regarding the WMMP process; changes in political representatives on the steering committee every few years; and the absence of legislation to enable greater control over waste diversion and site investigation.

Until shortly before the hearing, the KWMMP was expected to provide a Municipal disposal site by 1996. In 1991, the KWMMP consultants were asked to assess their rate of progress and establish a critical path for the plan's completion. The consultants for the KWMMP used the past experience of other WMMP exercises to support a revised completion date of December 2002. The MOE disagreed with this revised estimate for the completion of the KWMMP. Based on their commitment to streamline the government review period, the MOE predicted that a Municipal Landfill could be available by May of the year 2000.

SCAT viewed the revised completion date for the KWMMP as a conscious effort to bolster the establishment of a ten year need for the Storrington landfill extension. A number of documents were obtained through the *Freedom of Information Act* to support this contention. A July 2, 1991 memo (Exhibit 44) from the City's Chief Administrative Officer to the Deputy City engineer stated:

If Laidlaw would be willing to enter into an agreement with the City to receive City garbage until the year 2002 at a rate equal to the presently negotiated one which beyond December 31, 1995, would increase at no greater rate than the CPI and if the Township could negotiate similar terms for their garbage, then it might be in the City's and the Township's interest to support the Laidlaw application for a full term of ten years.

If no such financial agreement can be worked out for the period beyond 1995, then the City and the Township should proceed to seek Ministry of the Environment support for their own system and limit their support of the Laidlaw application to the capacity that relates to the period ending in December 1995.

The need for the extension of the Storrington Landfill was largely based on the "interim need" for disposal capacity pending the completion of the KWMMP and the development of a new municipal disposal site. The Board believes that the evidence presented by SCAT establishes reasonable grounds for linking the potential availability of disposal capacity at the Storrington site with the revised prediction for the completion of the KWMMP. However, the Board has also considered the MOE's prediction for the completion of the KWMMP and the possibility for some unavoidable slippage in the critical path of the KWMMP. The Board believes the duration of the interim need can be reasonably extended to the end of the year 2000.

The Board acknowledges that the first decade of waste management master planning under the *EA Act* has been fraught with difficult challenges and delays. However, greater progress can and should be made in the next decade for the following reasons:

- EA Board decisions and MOE policies are providing more authoritative guidance on the principles that are inherent in a good EA planning process;
- the Ontario Government is undertaking numerous initiatives to improve the EA process and to facilitate better and more timely progress with WMMPs;
- the EA process is internalizing the previously hidden costs of waste disposal and encouraging waste reduction and diversion;
- the available expertise within the private consulting community has grown tremendously;
- proponents are learning how to effectively integrate public interests and ecological principles into the EA decision-making process; and
- landfill design and operations are improving and the technologies for protecting groundwater, surface water and air quality have improved.

If the Township and the City of Kingston are diligent in their search for a Municipal waste disposal site, an alternative site should be available before the end of the year 2000. The Board does not believe the purpose of the *EA Act* would be upheld by considering a duration of interim need beyond the year 2000.

Longer Term Need

The proponent also submitted that a longer term disposal need would exist for the Townships surrounding Kingston that have not participated in the KWMMP. Prior to the submission of the EA, the MOE had apparently made recommendations to the proponent regarding the information required to adequately demonstrate need. The EA Branch had recommended the documentation of the relationship between the proponent's waste disposal contract volumes and the size of the undertaking. Additional information was expected regarding the predicted waste disposal rate(s) and the remaining capacity at other landfills within the study and service area (eg. Pittsburg Township Landfill). This information was not adequately documented in the EA. The Government Review of the EA concluded that the need for long-term waste disposal capacity at Storrington "remains questionable".

The Board believes that both intensity and duration are relevant to the evaluation of environmental and social impacts. A proponent that seeks a long term waste disposal site is increasing the duration of the potential impacts. The Board also believes that a general relationship exists between the quality of a proponent's EA process and the decision maker's ability to reconcile the size and duration of the need for disposal with the purpose of the *EA Act*. In the current case, the EA process was less than thorough.

Even the best located, designed and operated landfill will have some residual impacts. The issue of siting equity then raises the question: Should the "betterment of the whole" be achieved at the expense of "the part"? In other words, should the waste disposal needs of the entire Kingston area continue to be satisfied at the expense of the community and the natural environment surrounding the Storrington Landfill Site.

The citizens surrounding the Storrington Landfill have already shouldered the waste disposal burden for a significant portion of the Kingston area for more than fifteen years. The cumulative impact on the local community and the environment increases with each additional year that the Storrington site receives waste. The local community asserted that the time has come to let the existing Storrington site, the rural neighbourhood and the surrounding environment heal. The Board cannot fault the community for this perspective.

The Board has considered: the time constraint used in the preliminary screening of alternatives; the weaknesses of the proponent's public consultation process; the weaknesses of the proponent's consideration of the natural environment; the comments of the Government Review; the legitimate issues of siting equity; and the scarcity of evidence and documentation to support a long term need. The Board is not satisfied that a long term need has been demonstrated.

Size of Need

A consultant with the KWMMP, Mr. MacMillan, testified regarding predicted waste generation, diversion and disposal within the Kingston area. He estimated future quantities of waste (tonnage) that would require disposal by using projections for annual population growth rates, per capita waste generation and provincial waste reduction targets. According to these projections (Exhibit 46, Table 3), the quantities of waste requiring disposal can be summarized by the following Table.

Table 1 - Projections of Disposal Requirements

Year	* Tonnes	Kingston City and Township Cumulative Total	** Kingston Area Cumulative Total
1993	76,971	76,971	X 100/86 = 89,501
1994	78,583	155,554	X 100/86 = 180,876
1995	65,924	221,478	X 100/86 = 257,533
1996	67,291	288,769	X 100/86 = 335,778
1997	68,685	357,454	X 100/86 = 415,644
1998	70,105	427,559	X 100/86 = 497,162
1999	71,554	499,113	X 100/86 = 580,384
2000	66,989	566,102	X 100/86 = 658,258
2001	68,495	634,597	X 100/86 = 737,903
2002	70,031	704,628	X 100/86 = 819,335

* According to the consultant for the KWMMP, these figures represent the annual waste remaining for disposal after the provincial waste diversion targets of 25% by 1992 and 50% by the year 2000 have been met.

- ** The waste requiring disposal in the overall Kingston area was calculated by multiplying the cumulative (waste) projections for the City and Township of Kingston by a factor of 100/86.

The Board has determined that the duration of need has only been established to the end of the year 2000. The Board has also examined the proponent's critical path for obtaining the necessary approvals and constructing the necessary facilities to implement the proposed Storrington Landfill extension. The proposed extension would not be operational before September of 1993. Accordingly, the waste projections in Table 1 must be corrected by reducing the total 1993 disposal figure by approximately two thirds. This amounts to a reduction of approximately 60,000 tonnes from the cumulative waste disposal capacity required for the Kingston area. Therefore, the need for disposal capacity between September of 1993 until the end of the year 2000 is projected to be approximately 600,000 tonnes (658,258 - 60,000).

Contingency Capacity

The proponent noted that although Laidlaw has the residential waste stream "tied up", the ICI waste stream cannot be easily controlled. Laidlaw wanted a contingency capacity so that it could be a bigger player in servicing the ICI market within the Kingston area. The proponent submitted that a 25% contingency in disposal capacity was not unreasonable, based on: the predictions of waste requiring disposal by the KWMMP consultants; the proponent's desire to exploit other ICI markets within the service area; and the uncertain completion date and outcome of the KWMMP process.

The MOE noted that Mr. MacMillan's waste projections were much higher than the observed values. In fact, the waste received at the Laidlaw-operated Kingston transfer station declined by 37% between 1990 and 1991. The Chief Administrative Officer for the City suggested three reasons for this decline: the steep increase in tipping (disposal) fees due to the requirement for waste exportation once the original Storrington Landfill site closed; the effects of the recession; and waste reduction and diversion initiatives.

SCAT challenged the accuracy of the population growth projections that formed the basis for Mr. MacMillan's waste projections. The proponent argued that Mr. MacMillan chose conservative growth rates that should be considered within the context of the next decade, not the last few years of recession. Projecting annual population growth rates into the future does have a compound influence on the waste generation projections. However, the predicted annual population growth rates were relatively small (i.e. approximately 1% to 3%).

SCAT also challenged the proponent's allocation of the Kingston area's entire disposal requirements to the proposed Storrington expansion. According to SCAT, Laidlaw's business competitors contributed to the decline in waste reaching the Laidlaw Transfer station. This competitive factor was presented as support for the existence of economic alternatives to disposal at the Storrington Landfill.

The proponent agreed that some of the market may have been temporarily lost by Laidlaw when Storrington closed and the tipping fee at the transfer station increased to approximately \$155/tonne. However, the proponent anticipated that an approval for the Storrington extension would permit a significant drop in tipping fees and the re-establishment of the forecast waste disposal need once the economy improves.

The Chief Administrative Officer for the City testified that the exportation of waste to the Ottawa Carleton site was costing approximately \$4 million extra per year. If the Storrington expansion is approved, the City anticipates a significant reduction in tipping fees from their current \$155/tonne level. However, the tipping fee could be maintained above the actual disposal cost to generate a contingency fund (reserve) for long term waste management initiatives. Given the negative correlation (elasticity) between price and demand, the Board believes that a high tipping fee scenario would also contribute to a continuation of the reduced waste generation rate.

SCAT asserted that a sizeable contingency capacity had already been factored into the forecast need for disposal capacity at the Storrington Site. For example, Mr. MacMillan's waste disposal figures were based on trends established during a period of economic boom and the assumption that 100% of the Kingston Area's waste disposal needs would be satisfied by the Storrington Landfill site. The Board has used Mr. MacMillan's waste projection figures to calculate the disposal capacity required (600,000 tonnes) between September 1993 and December 2000. The evidence indicates that the 600,000 tonne figure already includes a significant contingency capacity. Therefore, additional contingency capacity is not warranted.

Proposed Service Area

The Storrington extension proposes to service the former users of the Landfill. Although the proposed service area includes fourteen municipalities, approximately 86% of the waste is generated by Kingston Township and the City of Kingston. The proponent included the Township of Portland as a former user of the site. The MOE noted that the Township of Portland was not listed on the site's Certificate of Approval.

Mr. Bruce used an Ontario Road Map to illustrate the proposed service area. He noted that several of the municipalities in the western portion of the service area were further from the Storrington Landfill than the Richmond Landfill. Both these landfills are operated by the proponent. Therefore, Mr. Bruce and SCAT questioned the appropriateness of including the distant municipalities within the Storrington Landfill's service area. The proponent submitted that it wanted some flexibility to service existing waste producers and capitalize on potential market opportunities.

The Board has already determined the maximum allowable tonnage (i.e. 600,000 tonnes) based on the waste projections for the established service area. If the addition of Portland Township causes a slight increase in the predicted waste flow, it would also result in an earlier closing of the Storrington Landfill. Therefore, the Board believes that the addition of Portland Township would be acceptable.

Impact of Reduced Capacity

Before final argument, the Board asked the parties to comment on the impact of a reduction in the proposed landfill extension's capacity. The proponent noted many aspects of the landfill design that could be affected, including: the landfill's footprint area; surface water drainage; final contours; leachate production; and leachate treatment (RBC) capacity. SCAT argued that a reduction in capacity would result in a savings in construction and operating costs. However, the proponent submitted that many of the costs would be fixed and therefore a reduction in capacity would not significantly reduce costs.

The proponent submitted that an approval based on a significant reduction in capacity could make the undertaking financially unattractive for a private for-profit business. If the capacity was not sufficient to defer the costs and provide a reasonable rate of return, the proponent could be forced to sell the site to the Municipalities (Volume 60, p.72).

The Board appreciates the private proponent's legitimate motivation to maximize its business opportunities. However, the Board must also consider the public and ecological interests that are relevant to the purpose of the *EA Act*. The Board has determined that the proponent's EA and evidence have demonstrated a need of only 600,000 tonnes and a term of landfilling that extends until the end of the year 2000.

BOARD CONCLUSIONS ON THE ACCEPTABILITY OF THE EA

SCAT asserted that the EA failed to: reasonably define and evaluate reasonable alternatives to the undertaking; reasonably evaluate reasonable alternative methods of carrying out the undertaking; and reasonably evaluate the "do nothing" alternative. The definition of reasonable is clearly significant to the Board's consideration of the EA.

The MOE EA Co-ordinator (Advisor) testified that the proponent must decide "what is reasonable?" based on its individual expertise and the input received during presubmission consultation. He noted three main factors that contribute to the EA Branch's evaluation of reasonableness: the mandate of the proponent; the problem or opportunity identified; and the input received from government agencies and the public.

Counsel for the Township of Kingston, Mr. Wilken, offered the following definition of reasonable (Volume 20, p.96):

the definition of reasonable is characterized by factors such as moderation, balance, not perfect, not extreme, nor absurd, but tolerable, fair and sensible. It is a relative term and is proportional to all the surrounding circumstances.

The Board believes that an EA process is reasonable if: it follows the rational planning process outlined in ss. 5(3) of the *EA Act*; it integrates environmental and social costs into the EA process; it utilizes existing MOE guidelines and recent Board decisions; and it arrives at a preferred alternative that is consistent with the purpose of the *EA Act*.

According to SCAT, the outcome of the current EA was pre-determined and therefore the EA should be judged unacceptable. SCAT noted a letter that was sent to prospective participants at the beginning of the EA process. The letter's heading stated: "Re: Storrington Landfill Environmental Assessment". The accompanying map marked the Storrington site with a prominent black square that was described as the study area. Although the EA document described a study area of 280 kilometres radius, the study area on the map covered a few square kilometres around the Storrington Landfill. The proponent's explanation was that the map was mistakenly reproduced from the *EP Act* application.

SCAT referred the Board to the following passages from the Joint Board's 1990 decision on the Meaford waste management EA (CH-88-03, Meaford):

If a proponent proposes to impose a landfill site, with all its attendant impacts, on neighbouring residents, it has the obligation to demonstrate to those residents, among others, that its selection of that site was fair and reasonable. p132

When section 5(3) of the *EA Act* requires a proponent to include in its environmental assessment an evaluation of the advantages and disadvantages to the environment of the undertaking and its alternatives, it is understood that the evaluation must be fair. To be fair, planning must have been done prior to the selection of the preferred alternative; if planning is done, so that the criteria are defined and prioritized in some way, so as to establish an evaluation framework, the danger of moulding the evaluation to fit the selected alternative is diminished p.73 ...

If such planning is not done prior to the selection of the preferred alternative, the evaluation cannot be fair. What will invariably happen is that after the preferred alternative is selected, the criteria will be established and prioritized, and the evaluations will be carried out consciously or not to achieve the result that the undertaking selected is the best one. ...

Despite the clear direction provided by the Meaford decision, the MOE's EA co-ordinator believed that the *EA Act* does not preclude the identification of a preferred undertaking near the beginning of the process. The preferred undertaking is then compared to a reasonable set of alternatives to test whether it is the most advantageous choice. However, he noted that the EA Branch prefers the identification of a broad problem or opportunity and the subsequent following of the rational planning model outlined in *EA Act* ss. 5(3).

Mr. Bullen was assigned to the EA after the completion of the second draft of the EA document and the public consultation process. He advised the proponent to make the implicit parts of the Draft 2 EA document more explicit. SCAT submitted that this advice could not remove the apparent bias in the EA process, it could only serve to camouflage the bias.

The Meaford EA was rejected for failing to follow a rational and fair site selection process pursuant to the requirements of *EA Act* ss. 5(3). This Board agrees with the Meaford decision. An EA should begin with the identification of a broad problem (opportunity) and then follow the rational planning model outlined in *EA Act* ss. 5(3) to objectively determine the preferred alternative. If the preferred solution (alternative) is pre-selected, the real and perceived fairness of the EA process is undermined.

The Meaford decision has established an important precedent for judging the acceptability of an EA. Some casual EA observers have erroneously interpreted the Meaford decision to require a "perfect" EA process and a search for the "perfect" site. However, a closer reading of the decision reveals that the Board seeks a rational, fair and reasonable EA planning process that complies with ss. 5(3) of the *EA Act* and furthers the stated purpose of the *Act*.

The Meaford decision had not been released when the current EA was submitted in October of 1989. Therefore, the current EA did not have the benefit of Meaford's interpretation and application of the *EA Act*. This factor does not reduce the requirement for compliance with the ss. 5(3) of *EA Act*. However, it is relevant to the Board's consideration of the EA.

The proponent's counsel agreed that the Meaford EA was unacceptable. He stated: "Meaford was an unmitigated disaster"; and "there is chaos in the selection process in Meaford" (Volume 20, p.79). He noted that the Meaford EA was almost indecipherable on such basic facts as: How many sites were considered? Why and when were they considered? How and when were the selection criteria developed? Why were different criteria used for the evaluation of different sites? And why were certain sites rejected? The apparent "chaos" in the Meaford EA was contrasted with the conclusion of the Government Review of the Storrington EA. The Government Review concluded that a rational and traceable planning framework was evident in the Storrington EA.

The proponent's counsel submitted that the particular circumstances of the EA are relevant to the issue of reasonableness. He argued that the Board should not demand perfection. The following passage from the North Simcoe decision (CH-87-03) was noted:

The Board, in setting out its extensive criticism of the process, should not be seen as demanding a perfect, well-planned and finely-tuned methodology (although that may be theoretically required by the Act, and is desirable). Resources are limited, precedent is meagre and the task is not small. What the Board sought was a semblance of a rational plan that could meet the minimum requirements of the Act.

The proponent also noted the conclusions of the Government Review regarding the Storrington EA (Exhibit 26, p.42):

On the basis of the information provided in the EA, including the two Addenda reports, the EA Branch concludes that the proponent has addressed the requirements of ss 5(3) of the *EA Act* in a rational and traceable planning framework.

The Government Review Team is satisfied with the level of detail of the EA documentation. If acceptance and approval is granted, residual technical concerns can be dealt with through terms and conditions.

However, the EA Branch is critical of the proponent's EA documentation with regard to the presubmission consultation activities and the quality of the documentation as it relates to Ministry policy.

Additional documentation would not likely alter the proponent's decision-making process. Should the proposed undertaking be approved, terms and conditions would be imposed that would offset the deficiencies.

The Board acknowledges that many of SCAT's criticisms are valid. The EA does not completely satisfy the emerging expectations of the public, the EA Branch or the Board. However, the Board has considered the following relevant circumstances:

- the conclusions of the Government Review;
- the preparation and submission of the *EP Act* application prior to the *EA Act* designation;
- the private proponent's expectation that the *EP Act* application would service their ongoing waste disposal contracts with the City and Township of Kingston;
- the guidance that was available from the agencies of the Ontario Government (eg. MOE, MNR) and Board decisions during the preparation of the EA;
- the MOE's acquiescence to the stringent time constraint placed on the EA process;
- the factoring of the provincial waste reduction and diversion targets into the calculation of the need for disposal capacity;
- the Board's determinations on the duration and quantity of need that has been established;
- the potential environmental, social and economic consequences of rejecting the EA; and,
- the Board's ability to carefully examine the preferred alternative before determining if the undertaking should be approved.

The Board accepts the conclusion of the Government Review that the proponent's EA complies with the basic planning requirements of ss. 5(3) of the *EA Act*. After considering the EA, the evidence, the unusual circumstances and the established period of need, the Board has determined that the provisions and purpose of the *EA Act* are not violated by the acceptance of this EA.

PART III - WHETHER BYLAW 1978-15 AS AMENDED SHOULD APPLY

At the preliminary hearing, Ms. Dixon raised the issue of Storrington Township bylaw 1978-15 as amended by By-law 1986-17. The proponent initially submitted that the by-law did not apply. However, the proponent took the precaution of requesting the MOE's referral of the by-law issue to the already scheduled EA hearing. The Board was subsequently directed to consider whether the by-law should apply to the proposed Storrington Landfill extension pursuant to s. 36 of the *EP Act*.

EP Act section 36 includes the following provisions:

- (1) Where a by-law of a municipality affects the location or operation of a proposed waste disposal site, the Director, upon the application of the person applying for a certificate of approval for the waste disposal site, may, by a notice in writing, and on such terms and conditions as he or she may direct, require the Environmental Assessment Board to hold a public hearing to consider whether or not the by-law should apply to the proposed waste disposal site.
- (2) The Environmental Assessment Board may order that the by-law referred to in subsection (1) does not apply to the proposed waste disposal site and the by-law shall thereupon be deemed not to apply thereto.

Mr. Ainley, a professional planning consultant, appeared on behalf of the Township of Storrington. He outlined the chronology of planning events relevant to the land use designation and zoning of the landfill site. His summary of the chronology of events is contained in Appendix D.

Township of Storrington Official Plan Matters

Mr. Ainley also provided evidence on the history of the Storrington Official Plan. The first Official Plan was approved by the Minister of Housing on November 22, 1976. The landfill site was in an area designated rural by the Official plan.

In 1981 Storrington Council prepared Official Plan Amendment No. 6 which was approved by the Minister of Municipal Affairs and Housing on March 24, 1982. Amendment No. 6 included the landfill site in the "Rural" land use designation in a subcategory referred to as Solid Waste Disposal (SWD) on the Official Plan Mapping. According to Mr. Ainley, the entire 24 hectare site north of Washburn Road and west of Johnson Sideroad was designated as SWD on the Official Plan mapping. He testified that this designation provided a definitive indication that the use of the land from that point forward was solid waste disposal.

Official Plan Amendment (O.P.A.) No. 17 was adopted by Council on February 22, 1988 and subsequently approved by the Minister of Municipal Affairs on March 16, 1988. O.P.A. No. 17 was a site specific amendment that applied to the proponent's buffer lands south of Washburn Road. This amendment designates the use of these lands for passive or active treatment of leachate from the Storrington landfill site.

The Township adopted a new Official Plan on November 6, 1990 and the Plan was awaiting provincial approval at the time of the hearing. Mr. Ainley noted that the new Official Plan proposes a new land use designation of "Waste Disposal" for the entire 24 hectare landfill site.

Existing Land Use

The existing land use pattern around the Storrington Landfill is consistent with Storrington's Official Plan which designates the lands surrounding the proposed site as "Agricultural Lands", "Mineral Resource Lands" and "Extractive Industrial Lands". Map 3 outlines the consolidated land use designations in the vicinity of the Storrington Landfill site.

According to the proponent's planning consultant, the absence of intensive residential development is indicative of the limitations imposed by the policies of the Official Plan and the Province in areas designated for agriculture; aggregate pits; and mineral extraction.

Mr. McDermott testified that the existing landfill site and the proponent's adjacent buffer lands represent a significant land use within the agricultural and resource based land use pattern. The landfill site and the proponent's adjacent buffer lands total approximately 58 hectares or 11.8% of the land area within one kilometre of the site. Mr. Ainley supported the general observations of the proponent's consultant. He testified that the proposed landfill is located in a setting where traditional agricultural and industrial extractive land uses would predominate for some time.

The land uses within one kilometre of the site include four extractive industrial sites licensed by the Ministry of Natural Resources (Map 3); several farms; and 29 single-family residential structures, two of which are owned by the proponent. The proponent's consultant estimated that the density of residential development within a one kilometre radius was 0.059 units per hectare or one unit per 16.8 hectares (one unit per 42 acres).

Mr. Bruce asserted that the analyses of the two planners failed to consider: the scenic beauty and serenity of the surrounding rural countryside; the close proximity of important recreational, historical and tourism resources such as Rideau Canal and the Washburn Locks; the natural significance of the provincially significant Washburn Wetland; and the opposition of the local community and the Township to the designation of the extractive resource lands to the north of the Storrington Landfill.

Mr. Bruce noted that only a small fraction of the annual licensed capacity of the four local mineral and aggregate sites was currently being utilized. He questioned whether the following Official Plan goal (section 2.4) would be fulfilled by the extension of a landfill in an area of agricultural, residential, historical, ecological and recreational significance:

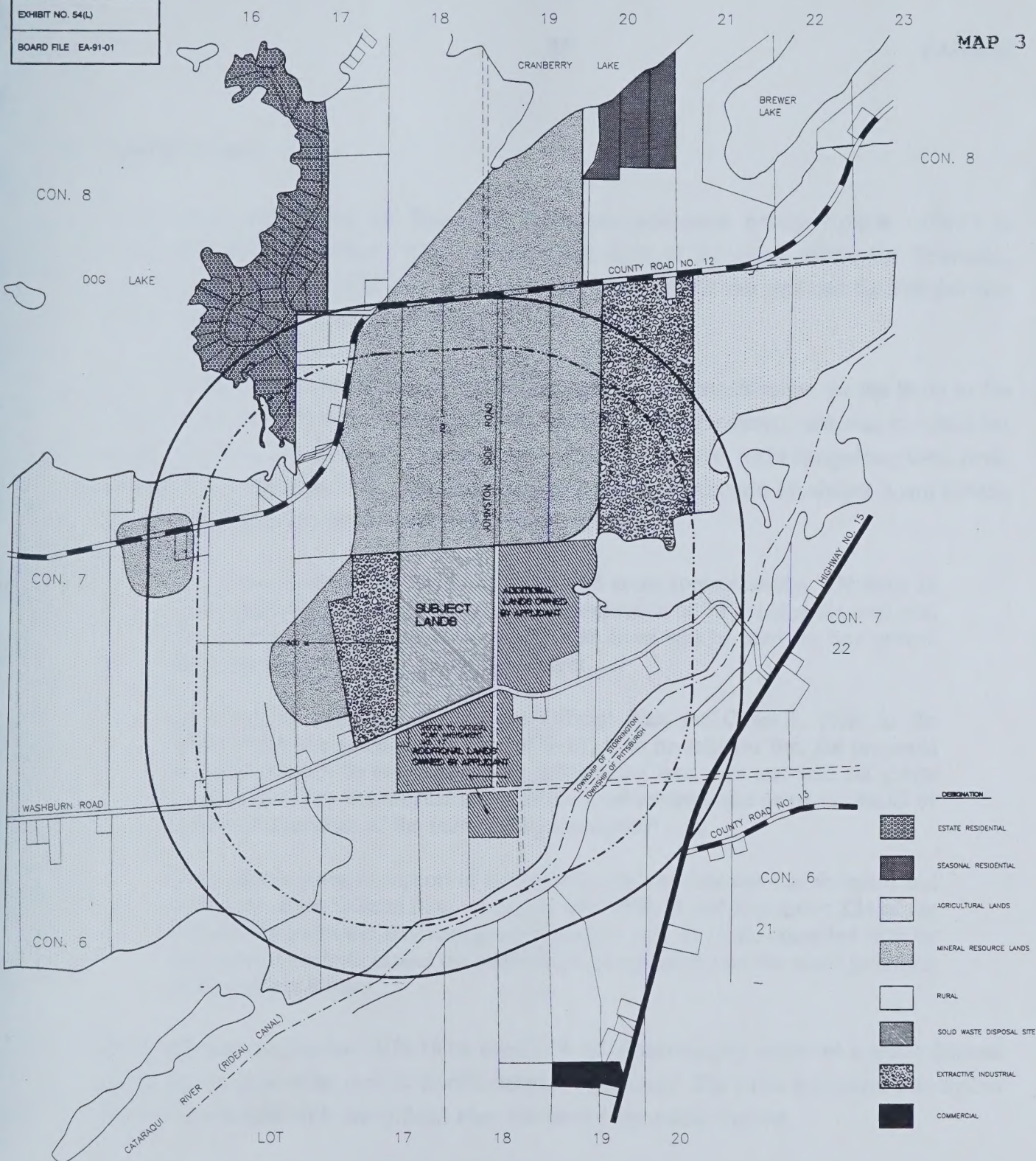
The primary goal of this Official Plan is that it should recognize the potential of the area's resources and encourage their optimum use in an effort to encourage the highest possible quality of environment for the residents.

SCAT noted that the Township of Storrington Official Plan does not provide for the protection of the recreational, tourism and natural environment values of the Rideau Canal and its associated Wetland areas (eg. Washburn Wetlands). The Official Plan primarily reflects agricultural, residential and mineral resource values.

EXHIBIT NO. 54(L)

BOARD FILE EA-91-01

MAP 3



SOURCE: THE OFFICIAL PLAN OF THE TOWNSHIP OF STORRINGTON PLANNING AREA. (1975)
 THE OFFICIAL PLAN OF THE TOWNSHIP OF PITTSBURGH PLANNING AREA. OFFICE CONSOLIDATION, 1986.

**CONSOLIDATED LAND USE DESIGNATIONS
 PART LOTS 14 TO 23, CONCESSIONS 6, 7 AND 8
 TOWNSHIP OF STORRINGTON AND
 PART LOTS 16 TO 22, CONCESSIONS 6, 7, AND 8
 TOWNSHIP OF PITTSBURGH**

SCALE 1: 5,000 METRIC

200 0 200 400 600

MICROMETRY & ASSOCIATES LIMITED
 URBAN & REGIONAL PLANNING CONSULTANTS

JUNE 14, 1992

Zoning By-laws

Mr. Ainley testified that the Township passed comprehensive zoning By-law 1978-15 to implement its Official Plan. This by-law zoned most of the lands within the Township, including the existing landfill site, rural "A". Since the landfill site predated the Official Plan and the zoning by-law, it became a legal non-conforming use.

In 1979, the Township received an application for a zoning modification on the lands to the south of the existing landfill. These lands include the area of the current proposal to extend the existing landfill. The Township passed By-law 1979-18 on June 6, 1979 designating these lands as Solid Waste Disposal "G". The bylaw was appealed to the Ontario Municipal Board (OMB) and the OMB decision included the following comments:

The site in question consists of an area of 38 acres approximately. Of these 38 acres, approximately 8 will be used for the extension of the existing disposal site. The evidence was that the balance of the 38 acres will be used for hay growth until approximately 1987 or perhaps longer. ...

By virtue of [section 5.2.7] of the Official Plan the Council, prior to the enactment of the amending bylaw [1979-18] is to be satisfied that the proposed development will be compatible with surrounding land uses and will not create or aggravate "any detrimental effect on the local environment or on the social or economic structures of the municipality concerned".

The evidence given in support of the municipality's by-law was that the spirit and provisions of the Official Plan, zoning by-law 1978-15 and Regulation 824 of the Regulations under the Environmental Protection Act, 1971 are complied with by the proposal made to extend the waste disposal operation into the lands governed by the subject by-law.

The OMB approved by-law 1979-18 on March 14, 1980 and thereby approved a waste disposal zoning for the area of the current landfill extension proposal. The OMB concluded that By-law 1979-18 conformed with the Official Plan and served the public interest.

Meanwhile, Comprehensive Zoning By-law 1978-15 had only received temporary approval from the OMB. According to the proponent's planning consultant, the OMB decision was very critical of By-law 1978-15. The OMB strongly recommended that the municipality immediately update the document and correct apparent deficiencies in the format and mapping. However, the OMB extended the temporary approval until By-law 1978 was amended in 1986.

By-law 1978-15 was finally updated with By-law 1986-17 and the amended by-law received final OMB approval. By-law 1986-17 removed the rural zoning from the northern half of the existing site and the "G" zoning on the southern portion of the site. The entire 24 hectare parcel was zoned Special Rural Disposal "SRD" to match the Official Plan designation of Solid Waste Disposal and the earlier zoning By-law 1979-18. Although By-law 1986-17 recognized the entire Storrington Landfill site, it added a number of new criteria that are highlighted by comparing the following excerpts from By-law 1978-15, and By-law 1978-15 as amended by By-law 1986-17. The relevant sections of the original By-law 1978-15 state:

No person shall hereafter use any land, nor erect, or use a building or structure in any Solid and/or Liquid Waste Disposal "G" Zone except in accordance with the following provisions. ...

No solid and/or Liquid Waste Disposal Zone shall be located within 0.8 kilometres (1/2 mile) of any existing or proposed residential or commercial area.

The most relevant amendments created by By-law 1986-17 are underlined in the following excerpts:

No person shall hereafter use any lot nor erect, alter, enlarge or use any building or structure for any purpose except in accordance with the provisions of this Section and other relevant Sections of this By-Law. ...

No landfill site shall be located within 800 metres of any waterbody, residential or commercial zone boundary or any existing dwelling.

Another By-law (1988-16) was passed on February 22, 1988 to rezone the proponent's agricultural lands south of Washburn Road from "A" to "A-1". This by-law implemented O.P.A. No. 17 by zoning the lands to permit leachate treatment. Mr. Bruce attended a public meeting regarding this planning matter and he wrote a letter to the Township requesting clarification on a number of issues regarding the proposed land use designation and rezoning. Mr. Bruce's letter was forwarded to the proponent, however, he did not receive a response until after the by-law was approved.

By-law 1986-17 and the Proposed Landfill Extension

The existing landfill and the proposed extension are less than 800 metres from the Cataraqui River and a number of existing dwellings. Therefore, the landfill site does not conform with the criteria in section 11.1 of zoning By-law 1986-17. Mr. Ainley noted that By-law 1986-17 conflicts with the OMB decision (By-law 1979-18) that zoned the southern portion of the lands for waste disposal. He testified that the new set back criteria in By-law 1986-17 compromised the historical intent of the OMB decision and Council as expressed through O.P.A. No. 6. He concluded that the new criteria in By-law 1986-17 should be viewed as an oversight.

The proponent submitted that By-law 1978-15, as amended by By-law 1986-17, does not prohibit the continued use of the landfill site for the proposed extension. The rationale of the proponent's planner included the following points:

- (i) the use of the subject property as an approved landfill site predates the coming into force of Zoning By-law 1978-15, and as such has been continuous since that date;
- (ii) the use of the subject property for landfill purposes is in conformity with the Special Rural disposal Zone classification placed on the property by By-law 1986-17;
- (iii) the use of the site for landfill purposes is a recognized use under the approved Official Plan as amended;
- (iv) the use of the site for landfill purposes is a recognized use under By-law 1978-15, as amended;

- (v) section 11.1(b)(2) of By-law 1986-17 applies to the establishment of a new landfill site, not to the on-going operation of a landfill site the establishment of which predates the coming into force of the Zoning By-law; and,
- (vi) Official Plan Amendment No. 17 and By-law 1988-15 permit the use of the proponent's lands immediately south of Washburn Road to treat leachate from the landfill site.

After reviewing the relevant Official Plan, zoning by-law and land use issues, the Township's planner concluded that the proposed expansion would be consistent with the Township's long range land use objectives, providing all environmental issues were addressed. He concluded:

From the standpoint of "good planning", it is evident that the site of the proposed landfill expansion is in a setting:

- (i) where traditional rural land uses (e.g., extractive industrial, agricultural) predominate and can be expected to do so for some time to come;
- (ii) where the opportunities for concentrated residential development are restricted by the Official Plan and the land use policies of the Province of Ontario; and
- (iii) where the continuation of the area's established land use pattern will not be unduly affected by the landfill operation.

Notice of By-law 1986-17 was given and it was presumably circulated to the relevant government agencies before it was approved by the OMB. The by-law was not appealed and therefore SCAT submitted that the provisions of the by-law should be enforced. SCAT argued that the by-law's 800 metre setback was intended to protect environmental and residential areas from incompatible land uses such as landfills. Mr. Bruce and Ms. Dixon agreed. They submitted that the new criteria in By-law 1986-17 were not an oversight. Ms. Dixon addressed the issue as follows:

The Official Plan for Storrington requires setbacks for a landfill site as stipulated in By-law 1978-15 and enhanced in By-law 1986-17.

Since this landfill opened in the early 1970's we have learned a lot about the impacts of landfill sites and the potential detriment to the environment they may create. Just as the Ministry of Environment imposes stricter requirements to landfill operations, so has the Township of Storrington. I am confident the By-law was adopted to afford protection of the natural environment; provide a buffer area from nuisance impacts of a landfill operation and to help prevent contamination of water supplies of private residents in the vicinity of a landfill. There has not been any evidence that would contradict that.

SCAT noted that the landfill has grown incrementally from a very small site located in a gravel pit to a relatively large site. It was noted that the series of decisions that approved this growth did not involve a Consolidated hearing on planning and environmental matters. It was submitted that the continued growth of the site would reduce the viability of surrounding residential, agricultural, natural environment and recreational land uses.

If the Board determined that the bylaw should not apply, SCAT submitted that economic loss or additional costs could be incurred by property owners near the site. SCAT noted that the MOE might require additional impact studies during the application process for a consent to sever property. SCAT was also concerned that a consent to sever property could be denied, directly or indirectly, due to the presence of the landfill and the section of the by-law that specifies set backs. SCAT submitted that the proponent should be obligated to compensate nearby property owners for any economic loss or additional cost attributable to the landfill site.

The proponent submitted that By-law 1986-17 prohibits the location of a landfill within 800 metres of a dwelling; it does not prohibit the location of a dwelling within 800 metres of a landfill. If granted status before the Township Land Division and/or Committee of Adjustment, the proponent agreed to appear and provide a legal opinion that By-law 1986-17 does not prohibit severances within 800 metres of the landfill site.

During the hearing, local residents expressed a concern regarding the potential effect of by-law 1986-17 on the rebuilding of a house in the event of a fire. The proponent noted the following excerpt from zoning By-law No. 1978-15, as amended by By-law No. 1986-17:

Nothing in this By-law shall prevent the use of any land, building or structure for any purpose prohibited by this By-law if such land, building or structure was lawfully used for such purpose on the day of passing of the By-law, so long as

it continues to be used for that purpose. If a legal non-conforming building should be damaged by fire, flood, wind, earthquake or other cause beyond human control, nothing in this By-law shall prevent such a building from being restored and strengthened to a safe condition, provided that the height and bulk generally are not increased and provided that reconstruction or restoration is commenced within twelve (12) months of the date on which the damage took place.

The Storrington Official Plan (section 2.11) recognizes that Storrington is an integral part of the larger region which surrounds the City of Kingston. The proponent noted that the City of Kingston provides the citizens of Storrington with goods and services, employment opportunities and cultural and educational facilities. The proponent submitted that the Township of Storrington can provide an economical and environmentally responsible waste disposal service the Kingston area.

BOARD CONCLUSIONS ON THE BY-LAW ISSUE

Ms. Dixon, Mr. Bruce and SCAT raised understandable planning issues regarding the landfill site and By-law 1986-17. The existing Official Plan and the by-laws relevant to the landfill site present a very convoluted and confusing land use picture. However, the Board notes that section 36 of the *EP Act* requires the Board to determine whether the by-law should apply, not whether it does apply. Therefore, the Board need not make a finding on the status of the by-law to reach a determination that the by-law should not apply.

The Board does not question the reasonableness of By-law 1986-17 regarding the establishment of general set-backs for the location of landfill sites. Set-backs can be a valuable planning tool for reducing potential conflicts between different land-uses. However, *EP Act* section 36 appears to apply to situations where the location of a landfill on an environmentally acceptable site could be frustrated by the actions of a local Municipality.

The EA hearing involved a thorough examination of the economic, social, land-use and ecological impacts of the proposed landfill extension. Under this circumstance, the Board believes that the consideration of whether the by-law should apply is subsidiary to the proposal's compliance with the purpose and provisions of the *EA Act*. Therefore, if the public's interest in the protection, conservation and wise management of the environment is satisfied, then the Board will also determine that the proposed By-law should not apply.

PART IV - WHETHER THE PROPOSAL SHOULD BE APPROVED

Part IV will determine whether the Storrington landfill extension should be approved, and if so, the conditions that should apply to any approval (*EA Act* ss. 12(2)(c) & ss. 12(2)(d)). The Board will consider: the environment that could be affected; the potential environmental effects of the proposal; the actions that may be reasonably necessary to prevent, mitigate or remedy the effects; and the advantages and disadvantages of the alternative methods for carrying out the proposal (*EA Act* ss. 5(3)(c)).

The Board has organized its examination of the many issues under the following general topics: Summary of Proposed Undertaking; Groundwater Impact Assessment; Surface Water Impact Assessment; Ecological Impact Assessment; Air Quality Impact Assessment; Social Impact Assessment; Economic Impact Assessment; and Cumulative Impact Assessment.

The proposed undertaking will be summarized to provide the context for the remaining considerations. The Board will then address the seven environmental assessment topics and determine whether, on the balance of probabilities, the environmental impacts can be prevented, mitigated or remedied to provide for the protection, conservation and wise management of the environment. After addressing the separate topics on environmental assessment, the Board will provide a final determination regarding the proposed Storrington Landfill extension and the issue of the by-law.

SUMMARY OF THE PROPOSED UNDERTAKING

During the hearing, the proponent made changes to various technical aspects of its proposal and a revised summary of the undertaking was submitted as Exhibit 184. The revised proposal included the following features:

- an engineered clay liner beneath the proposed extension area to contain leachate and a complete underdrain leachate collection pipe network to drain the leachate to a leachate collection sump;
- a common leachate sump for the leachate collected from the proposed extension and the three hectares of the existing site that are lined;

- a primary and back-up system for pumping leachate from the sump via forcemain to an enclosed leachate treatment plant;
- a constructed marsh treatment system to remove phosphorus from the effluent of the leachate treatment plant and a tertiary treatment process contingency;
- a monitoring program for the proponent's property to detect contaminant movement towards the property perimeter and to trigger a purge well contingency plan for contaminant capture and treatment;
- a plan to protect surface water quantity and quality through ditching, culverts and sedimentation ponds;
- a plan to place a several-metre high berm around the southern and eastern perimeters of the site to reduce noise and visual impacts;
- a plan to plant trees and shrubs around southern and eastern portions of the site to reduce visual impacts;
- a plan to reduce odours through the installation of charcoal canisters in the manholes at the existing site and the proposed extension;
- a contingency plan for controlling landfill gaseous emissions and odours by installing an active gas collection and combustion system, if monitoring demonstrates that it is required;
- a plan for property value protection and property-specific mitigation of residual nuisance impacts (eg. noise, dust, odour, visual); and,
- various other engineered and non-engineered proposals for preventing or mitigating social and environmental impacts that will be highlighted in the following sections.

SCAT submitted that the proposed undertaking had changed fundamentally over the course of the hearing. The proponent noted that environmental standards and technology are evolving rapidly and suggested that improvements to an EA proposal can and should be made after the EA has been submitted. The proponent submitted that the only major change was the replacement of the original proposal for leachate recirculation with the revised proposal for an engineered leachate treatment facility. The proponent indicated that the changes resulted from consultations between the parties that were encouraged by the Board's procedural directions.

According to the proponent, it would be unfair and detrimental to the environmental assessment process to subsequently penalize the proponent for improving its undertaking. Although the Board agrees that some improvements can and should be made after an EA's submission, the EA presubmission process is the most appropriate forum for integrating social and environmental interests (costs) into the selection and design of an undertaking.

GROUNDWATER IMPACT ASSESSMENT

The existing and proposed landfill areas are above the water table. Precipitation moves downward in these areas until it reaches the water table and then moves laterally with the groundwater flow system. Groundwater is the source of domestic water supply for the residents surrounding the Storrington Landfill and therefore the local residents are concerned about potential sources of groundwater pollution.

Previous Board decisions have established important principles for evaluating potential groundwater impacts from landfill sites. This Board will examine the current proposal in light of the following principles enunciated in the Halton Landfill decision (CH-86-02):

- 1 - the hydrogeology of the area must be comprehensible to the Board; and
- 2 - contaminant loss should be minimal (and preferably zero), as a result of either natural containment or engineered works.

Hydrogeology and Comprehensibility

Leachate is the contaminated liquid which forms when rainfall and snowmelt percolate through landfill waste and "leach" chemical contaminants out of the waste. Some of the factors influencing leachate volume and contaminant concentrations are the area of the landfill site; the amount by which precipitation exceeds evaporation; the slope and permeability of the landfill surface; the composition and quantity of waste material; the rate and duration of decomposition; and the effect of dilution and attenuation factors.

Existing Site

Only 3 hectares of the existing 13 hectare landfill is lined with clay. Therefore, leachate has been seeping into the underlying groundwater flow system for almost twenty years. Contaminant monitoring around the landfill perimeter was utilized to interpret local groundwater flow.

Hydrogeological Monitoring

Hydrogeology is the study of groundwater and chemical movement through bedrock and overburden materials. Hydrogeological studies often utilize drilled monitoring wells to identify subsurface materials and to measure important groundwater flow characteristics. Biannual groundwater monitoring has been conducted around the Storrington Landfill for several years.

The proponent's monitoring program sampled domestic wells and monitoring wells in the vicinity of the site. The initial wells included monitors 2S, 2D, 3S, 3D, 4S and 4D. Additional monitoring wells M5, M6, M7 and M8 were drilled in 1985 around the southeastern perimeter of the site. Monitoring wells M10 through M19 were established in 1986 around the southern and western boundaries of the site. The proponent subsequently drilled monitoring wells 20 through 28 during 1991/1992 to address the concerns of the hydrogeological experts for the intervenors and the MOE. Map 4 illustrates the location of the various groundwater monitoring wells.

The stratigraphy of the subsurface materials was recorded by field inspection of drill-cuttings during the drilling of the monitor wells. These records specify the materials (eg. clay, silt, sand, till, bedrock) encountered at various depths. The monitoring wells were instrumented to measure hydraulic conductivity, hydraulic head and water quality. Some monitoring wells sample these parameters in different geologic deposits at different depths.

Overburden Geology

The landfill site contains a complex bedding structure of clay, silt, sand, gravel and till. Eight distinct stratigraphic units have been deposited upon the bedrock topography. The overlapping depositions of these materials occurred during the slow retreat of a glacier that resulted in 50 to 70 metre deep deposits in the area of the proposed extension. The witness statement for SCAT's hydrogeologist included the following description of the overburden deposits (Exhibit 185, p.10):

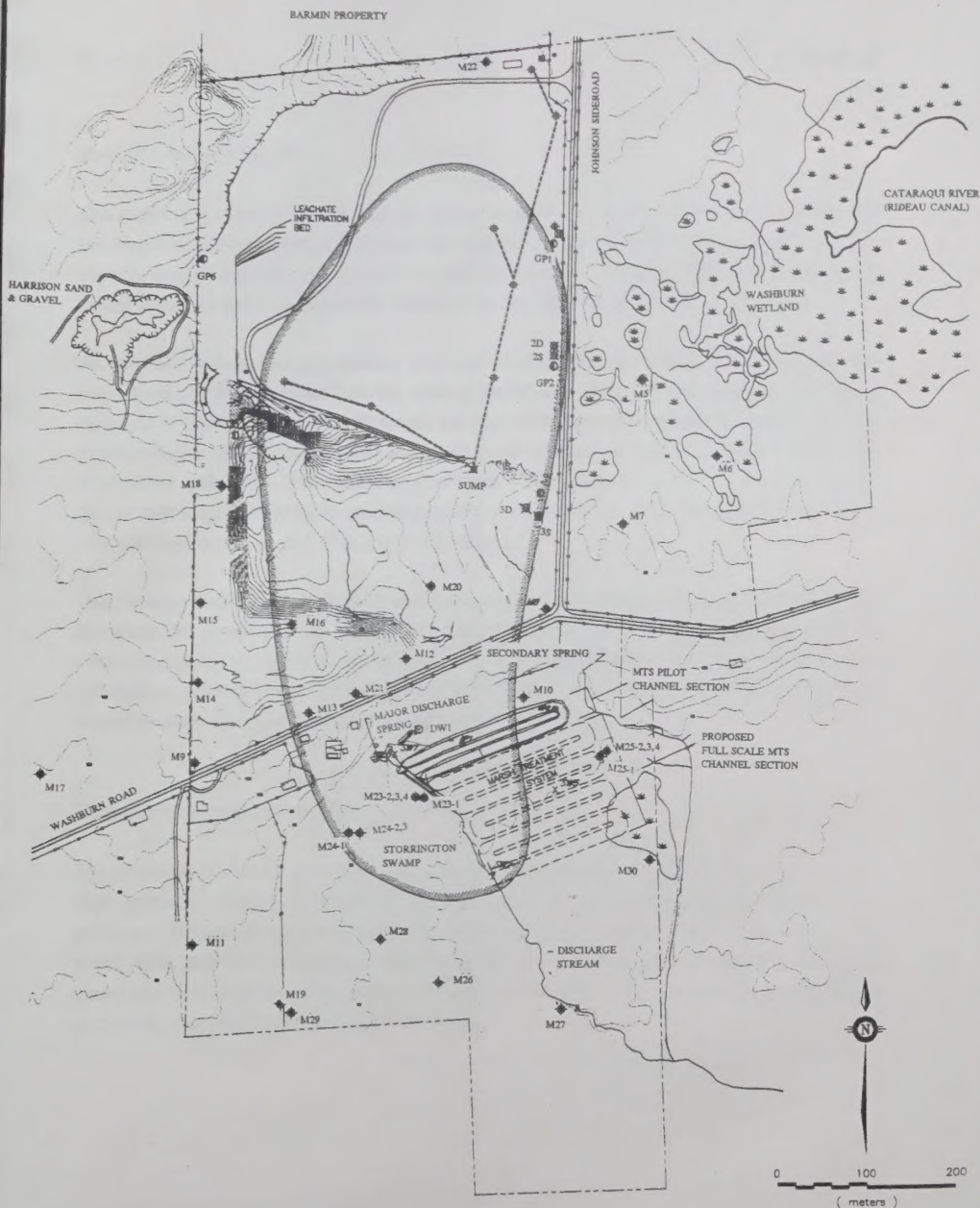
There are extensive and very complex glaciofluvial [glacial river origin] sand and gravel deposits in the landfill area, which are generally thicker in the bedrock valleys and thinner on the ridges. The glaciofluvial deposits were exposed at the ground surface under parts of the existing landfill, but across most of the landfill area these deposits are buried beneath (often thick) deposits of overlying glaciolacustrine [glacial lake origin] sands, silts and clays.

The glaciofluvial sands and gravels tend to become finer southwards, reflecting an increasing distance from the glacier which was the sediment source. The deposits also tend to become finer upwards through the depositional sequence, reflecting the increasing distance from the sediment source as the glacier receded northwards.

The glaciofluvial deposits are of considerable importance because of their high permeability. Groundwater movement is most rapid in these deposits, and they will be preferred pathways for the movement of leachate derived contaminants in the landfill area.

Glaciolacustrine sands overlie the glaciofluvial sands and gravels. In most places these are in turn overlain by silts or clays, but the sands are exposed at the ground surface along Washburn Road in the area of monitors M12 and M13.

[Silt and clay] deposits extend from the ground surface downward to the underlying sand deposits across much of the landfill area. The silt and clay deposits appear to be absent under the western portion of the existing landfill. This allows leachate to drain freely from the landfill into the underlying sand and gravel deposits. Silt and clay are also absent under parts of the major discharge area south of Washburn Road.



LEGEND

- DENOTES BOREHOLE LOCATION
- ◆ DENOTES PIEZOMETER LOCATION (MULTI-LEVEL)
- DENOTES PIEZOMETER LOCATION (SINGLE POINT)
- ◆ DENOTES DOMESTIC WELL LOCATION
- ⊙ DENOTES DISCHARGE WELL LOCATION
- DENOTES GAS PROBE
- ⊙ DENOTES MINI PIEZOMETER
- ⊙ DENOTES TEST PIT LOCATION
- x DENOTES SURFACE WATER SAMPLING LOCATION
- ⊕ DENOTES MANHOLE LOCATION
- DENOTES BENCHMARK
- DENOTES TOPOGRAPHIC CONTOUR (m.a.s.l.)
- Y--- DENOTES CREEK / STREAM / DITCH
- DENOTES POND OR LAKE
- DENOTES SWAMP
- DENOTES BUILDING
- DENOTES FENCELINE
- === DENOTES ROADWAY
- === DENOTES LANEWAY
- DENOTES PROPERTY BOUNDARY
- DENOTES LEACHATE COLLECTION PIPE
- DENOTES LEACHATE PLUME

NOTES:

1. TOPOGRAPHIC CONTOURS SHOWN ON THIS MAP, WITHIN THE LANDFILL SITE ARE BASED UPON A TOTAL STATION SURVEY OF FEBRUARY 1991.

NO.	REVISION	DATE	BY
2	TOTAL STATION CONTOURS ADDED	JULY 92	G.R.G.
1	TOTAL STATION SURVEY INFORMATION ADDED	JUNE 92	G.R.G.
PROJECT NUMBER: 2800		DRAWN BY:	DESIGNED BY:
DATE: 23 FEBRUARY 1993		CHECKED BY:	
SCALE: 1:5500		CAD FILE NO.: 2800-SPS	

FIGURE: 1

SITE PLAN AND SAMPLING LOCATION MAP

LAIDLAW WASTE SYSTEMS (STORRINGTON) LTD.

TOWNSHIP OF STORRINGTON
PROVINCE OF ONTARIO.

WATER AND EARTH SCIENCE ASSOCIATES LTD.

P.O. BOX 430

CARP, ONTARIO. K0A 1L0

Rate of Groundwater Flow

The coarse grained deposits of sand and gravel beneath the landfill site provide a preferential pathway (aquifers) for groundwater and leachate movement. The finer grained silts and clays impede groundwater (aquitards) and leachate movement. Therefore, the distribution of the coarse materials exerts considerable influence on leachate and groundwater movement.

An empirical estimate of groundwater flow was obtained from the timing of leachate detection in the monitors downgradient from the existing landfill site. This method yielded a groundwater flow rate of approximately 35 to 50 metres per year for the glaciofluvial gravel aquifer. SCAT's hydrogeologist utilized Darcy's law (Appendix E) to estimate potential flow rates through other overburden materials. The following flow rates were estimated in metres per year (m/yr): glacial lake clays 0.06 m/yr (6 cm/year); glacial river sands 1.6 m/yr; fine glacial river gravel 16 m/yr; and coarse glacial river gravel 60 m/yr.

The geologic materials in the landfill area show a tremendous range of hydraulic conductivities. However, the porosity of the different deposits was fairly similar. If the hydraulic gradients were roughly equal, Darcy's law indicates that groundwater movement would be more than 1,000 times more rapid through gravel than through sand. Groundwater movement through sand would be more than 1,000 times more rapid than through clay.

Direction of Groundwater Flow

The proponent's consultants presented substantial evidence on the regional and local groundwater flow patterns. Hydraulic gradients are downward at the landfill indicating groundwater recharge. Precipitation seeps through the landfill producing leachate, percolates down to the water table, and moves southward with the groundwater flow system through the underlying gravel and sand deposits. This general conclusion was supported by the hydrogeologists for the proponent, the MOE and Storrington Township.

The monitoring well observations also support the hypothesis that groundwater flow is predominantly southward towards the groundwater discharge area around the Storrington Swamp. Groundwater chemistry data was utilized to map the extent and cross-section of the existing leachate plume. The MOE hydrogeologist, Mr. Kaye, produced particularly useful mappings (Exhibit 163B) of the characteristics of the existing leachate plume. The results suggested that the plume has moved directly southward without crossing the eastern and western boundaries of the proponent's property.

Potential Changes to Groundwater Flow

There are a number of licenses for mineral and/or aggregate extraction in the vicinity of the Storrington Landfill. The subsurface deposits of the Barmin property are part of the groundwater system that flows beneath the Storrington Landfill site. Therefore, it is important to consider whether future quarrying activities on the Barmin property might affect the flow of leachate contaminated groundwater from the landfill site.

A hydrogeological report had been prepared for the proposed Barmin quarry (Exhibit 225). This report concluded that quarrying would not present a problem for leachate movement from the disposal site. If full mining of the sandstone underlying the Barmin property occurred, the groundwater level could be lowered to an elevation of about 92 metres ASL. The report utilized a simplified linear flow equation to estimate that the drawdown influence would only extend 450 metres (1500 feet) from the quarry. According to the report, the drawdown would not significantly alter the movement of groundwater and/or leachate near the disposal site. However, the report also notes that after mining the potentiometric surface could recover to above the original static level downgradient from the closed quarry.

The potential effect of quarrying was not thoroughly examined by the hydrogeologists for the various parties. The Board believes that the potential impact of disruptions to the upgradient groundwater flow system should not be easily dismissed. Careful monitoring of groundwater flow would be necessary to ensure that future aggregate and mineral extraction does not change groundwater flow near the landfill site.

Bedrock Geology

A few massive bedrock outcrops occur near the northwest corner of the landfill site. The remainder of the existing landfill area is hidden beneath waste and the bedrock in the area of the proposed extension is hidden beneath deep glacial deposits. According to the well drilling results, white diorite bedrock underlies these glacial deposits.

A bedrock contour map (Exhibit 141) was developed from the well drilling results. The bedrock beneath the existing site slopes steeply downward towards the south. A series of bedrock ridges and valleys trend northeast-southwest in the southern area of the proposed extension and in the area south of Washburn Road. The first bedrock valley is centred near monitor M16 north of Washburn Road. A bedrock ridge, running parallel to Washburn Road, separates this valley from a second valley south of the road. Another buried bedrock ridge is located near the southern property boundary. Cutting perpendicularly across these ridges in a northwest to southeast direction is a deep valley running from M20 through M27. According to SCAT's hydrogeologist, bedrock topography may be exerting an important influence on groundwater flow.

Board Conclusions on the Comprehensibility of the Hydrogeology

Prior to the hearing, the available hydrogeological information for the Storrington Landfill contained obvious gaps. For example, accurate cross-sections and mappings of the existing leachate plume were not available. The monitoring gaps aroused the suspicion of SCAT. Whether this suspicion was warranted or not, it contributed to public anxiety and stress and increased the likelihood of a contentious and lengthy hearing. The proponent addressed the intervenors' concerns by conducting additional drilling and monitoring prior to, and during, the hearing process. The last-minute provision of this important information contributed to the length and complexity of the hearing and the time required for the Board's decision.

The existing landfill relies on leachate dilution and attenuation within the groundwater flow system. SCAT's hydrogeologist suggested that a thorough monitoring programme is particularly important for an "attenuation" landfill to ensure contaminants are not moving off-site. However, several of the original groundwater monitors had never been monitored and several other monitors had only been sampled once. The proponent's hydrogeologist testified that some of the monitors were not functioning because of difficulties in developing and maintaining the well holes. SCAT's hydrogeologist commented on the proponent's monitoring as follows:

The work that was done up until just before the hearing ... had very significant shortcomings ... It really didn't provide an adequate basis ... for assessing the potential impact of the proposed expansion, and I think would have lead to great difficulty at the hearing ... (Volume 48, p36)

I think its fair to say that we've been lucky at this landfill. ... the monitoring in the past was such that even if we had contamination going off the property, chances are we would not have been detecting it. (Volume 48, p87)

... And there has been improvement it is a vastly different undertaking from what it was, and our knowledge of the whole landfill area is much improved ... (Volume 48, p37)

The Board agrees with these statements by SCAT's hydrogeologist. The landfill site operator has a responsibility to conduct thorough, accurate and ongoing sampling of groundwater chemistry and flow characteristics. This information should be readily available to the MOE and the public in an understandable format. The proponent has the responsibility to repair or replace non-functional monitors that provide important information. If the hydrogeological information is not thorough and accurate, the Board cannot be confident that the leachate can be contained within the site.

The proponent's hydrogeology consultants worked diligently during the hearing process to provide additional information to satisfy the parties and the Board. Additional wells were drilled, samples were analyzed, and additional groundwater maps and visual aids were prepared. However, the hydrogeologists for SCAT, the MOE and Storrington Township presented important information that the proponent should have prepared prior to the hearing. The following information provided by the MOE and SCAT made the hydrogeological assessment more comprehensive and comprehensible:

- graphs of long-term trends in leachate contaminant concentrations;
- historic data tables for key groundwater contaminants (eg. Chloride, Conductivity) for groundwater monitors and for local domestic wells;
- graphs of long-term groundwater quality trends for the perimeter groundwater monitors;
- accurate delineation of the existing plume and its rate and direction(s) of expansion and mappings of aquitards, aquifers and chloride concentrations;
- a summary of corrections and up-dating of EA information in light of recent findings about the site hydrogeology; and
- recommended trigger mechanisms for the installation and activation of contingency measures to prevent off-site impacts.

The original EA documentation did not contain a thorough and accurate analysis of the hydrogeology of the area. However, after reviewing the additional hydrogeological evidence prepared for the hearing, the Board concludes that the local hydrogeology is complex but comprehensible.

ABILITY TO PREVENT OR MINIMIZE CONTAMINANT LOSS

The Board must be satisfied that all reasonable and practical measures are being taken to prevent off-site impacts from the existing site. Therefore, the Board examined the potential groundwater impact from the existing site before considering the proposed extension.

Leachate Recirculation

The southeastern 3 hectares of the existing 13 hectare site has a clay liner. Leachate is collected from this area through a collection system along the southern and eastern perimeters. The leachate drains into a leachate sump and it is then pumped to the unlined western portion of the existing site. The leachate is then discharged into an underground infiltration trench and it eventually drains into the groundwater flow system beneath the site.

Leachate recirculation was a part of the original proposal for the landfill extension. Leachate from the existing and proposed site was to be pumped into the underground infiltration trenches above the existing unlined site. Dilution and attenuation processes in the existing landfill and the underlying groundwater flow system were to be relied upon to prevent off-site impacts.

A number of the hearing parties expressed dissatisfaction with this proposal during the prehearing meetings and discussions. The partially lined existing site has collected approximately 300,000 litres of leachate per year since it was closed. However, a fully lined expansion area could generate up to 28,000,000 litres of leachate per year. There was a concern that the recirculation of large volumes of leachate would alter the natural groundwater flow and overwhelm the available dilution and attenuation capacity.

SCAT's hydrogeologist noted that leachate recirculation can lead to problematic increases in the volume and/or the concentration of the leachate contained in the landfill. If leachate mounding occurs, the probability of leachate springs and surface water contamination increases. The concerns raised during the prehearing meetings apparently had an impact on the proponent. The recirculation proposal was withdrawn at the beginning of the main hearing. The recirculation plan was replaced by a proposal for a leachate treatment facility.

The evidence indicated that a groundwater leachate plume from the existing site already extends several hundred metres south beyond Washburn Road. Given this evidence, the abandonment of the leachate recirculation proposal was a wise decision.

Leachate Chemistry

Analytical tests have been performed on samples from the leachate collection sump. The 1991/92 leachate sampling showed elevated levels for: chloride; conductivity; chemical oxygen demand (COD); biological oxygen demand (BOD); un-ionized ammonia; alkalinity; iron; benzene; toluene; ethyl benzene; xylene; diethyl ether; trichloroethylene; and a number of other organic compounds.

SCAT's hydrogeologist noted the proponent's failure to conduct trend analyses on the contaminant levels in the leachate. He performed such analyses and detected upward trends for both chloride and conductivity over the last several years. Table 2 is reproduced from the witness statement of SCAT's hydrogeologist. It compares the ranges of three selected chemicals in the leachate with the Ontario Drinking Water Objectives (ODWO) and the Ministry of the Environment's Reasonable Use Limits for off-site groundwater contamination. This table demonstrates the importance of confining leachate contaminated groundwater to the proponent's property. Concentrations are in milligrams per Litre (mg/L) or micrograms per Litre (ug/L), which are often expressed as parts per million (ppm) and parts per billion (ppb) respectively.

Table 2: Levels of Three Chemicals in Leachate at the Leachate Collection Sump

Chemical	Range of Leachate concentrations	Ontario Drinking Water Objectives	MOE Reasonable Use Policy Limit
Chloride (mg/L)	35 - 825	250	125
Benzene (ug/L)	ND - 76	5	1.25
Trichloroethylene (ug/L)	ND - 71	50	12.5

Note - ND means chemical not detected

Background Groundwater Chemistry

The term "background" is referred to in the MOE's groundwater Policy (Reasonable Use) as water that is absent of human contamination. It provides a benchmark for assessing the impacts of contaminant sources. SCAT's hydrogeologist noted the following two parameters that are commonly used to assess groundwater quality in the vicinity of landfill sites:

Conductivity is a measure of the ability of water to transmit an electric current. The higher the concentrations of chemicals in the water, the higher the conductivity. The conductivity of landfill leachates is relatively high.

Chloride is often used to determine the extent of contamination near a landfill site. Landfill leachates usually have relatively high chloride levels and chloride is one of the most mobile contaminants in groundwater. The Ontario Drinking Water Objectives specify a maximum chloride concentration of 250 mg/L in drinking water.

Groundwater monitor M6 is located to the east of the landfill site and M17 is located to the west. According to SCAT's hydrogeologist, the water quality at these monitors approximates background groundwater quality. These monitors have chloride levels less than 10 mg/L and conductivities less than 600 umhos/cm. SCAT's hydrogeologist prepared the following table of four groundwater quality parameters for leachate and uncontaminated groundwater:

Table 3: Indicators for Distinguishing Leachate from Natural Groundwater

Indicator Parameter	Levels in Leachate	Levels in Background groundwater
Conductivity (umhos/cm)	1000 - 10000	< 600
Chloride (mg/L)	50 - (800)	< 10
BOD (mg/L)	20 - 600	< 10
COD (mg/L)	100 - 1000	< 20
Organic Chemicals (eg. benzene, diethyl ether)	detectable	undetectable

There is some natural variation in groundwater quality in the area surrounding the landfill site (eg. iron). However, there are a number of chemicals in the leachate which can be used to distinguish between background groundwater and leachate contaminated groundwater. Organic chemicals such as benzene or diethyl ether (DEE) are good indicators of leachate contamination in the groundwater in the vicinity of the landfill.

MOE Guidelines for Groundwater Protection

The MOE has established policies to protect the quality of groundwater. One of these policies is No. 15-08, entitled *Incorporation of the Reasonable Use Concept into MOE Ground Water Management Activities*. The "Reasonable Use Policy" (RUP) contains the following excerpts:

This policy establishes the basis for determining the reasonable use of groundwater on property adjacent to sources of contaminants and explains the role of a reasonable use approach in the Ministry's various activities related to groundwater quality ...

The policy addresses the levels of contaminant discharges considered acceptable by the Ministry and the levels of contamination in water supplies which would warrant restoration of those water supplies ...

In assessing the amount of degradation that is acceptable, consideration is given to the natural, uncontaminated quality of the ground water, the present quality of the ground water and potential contamination of the ground water from all sources.

The Reasonable Use Policy permits some lowering of water quality beyond the property boundary, provided the Ontario Drinking Water Objectives (ODWO) are not exceeded. Appendix F contains the formula for calculating reasonable use limits. SCAT's hydrogeologist commented on the application of the Reasonable Use Policy as follows (Volume 48, p34):

It tends to look a bit different from the perspective of somebody living next to a landfill, if a chemical from the landfill leachate has gotten into somebody's water supply.

Even if we tell them that the Ministry policies say that it is okay, reasonable use limits haven't been exceeded, from a perspective of somebody living next to the landfill, they might not draw a lot of assurance from that. They might decide their water supply isn't useable anyways.

The responsibility for applying the Reasonable Use policy usually rests with the MOE's Regional Director or the EA Board. The Board has been guided by the Reasonable Use Policy in many of its decisions. However, the Board recognizes the weaknesses in the policy. For example, consider four successive sources of chloride contamination that fully utilize the 50% reduction in groundwater quality permitted by reasonable use. This would result in downgradient contaminant levels that are 93% of the maximum concentrations permitted by the ODWO.

Reasonable Use is based on individual contaminant levels. However, SCAT's toxicologist noted that multiple contaminants in groundwater may have synergistic (more than additive) effects that are difficult to predict. If several contaminants approach the Reasonable Use limits simultaneously, he foresaw a greater cause for concern. He suggested that human and ecological health impacts warrant the consideration of potential cumulative impacts.

The issues described by the hydrogeologist and the toxicologist for SCAT are relevant. The cumulative impact of the Reasonable Use Policy could be an unreasonable groundwater impact. The MOE's Reasonable Use Policy employs a concentration approach to environmental planning and regulation. Surface water management is gradually evolving towards a mass loading and assimilative capacity approach. Groundwater is an important source of domestic well-water and it provides cool and clean replenishment of surface waters (eg. Storrington Swamp). Therefore, wise groundwater management is equally as important as wise surface water management.

Bedrock Groundwater Flow

SCAT's hydrogeologist and Mr. Bruce expressed a concern that leachate may spread off-site through bedrock faults. The proponent's hydrogeologists discounted this possibility. They noted the impermeable, unfractured bedrock character in the northwest corner of the existing landfill. They also presented evidence that groundwater flow near the existing landfill is upward from the bedrock into the overburden aquifer. If leachate did enter the bedrock groundwater, they testified that it would flow southward within the proponent's property towards the groundwater discharge area south of Washburn Road. The proponent's hydrogeologists concluded that leachate was unlikely to spread off-site through the bedrock groundwater environment.

The hydrogeologists for Storrington Township and the MOE supported the aforementioned conclusion. In their professional opinion, the migration of leachate through the bedrock is not likely to cause significant off-site impacts to groundwater quality. Storrington Township's hydrogeologist stated (Exhibit 182, p.6):

... the concern of a fault being present and acting as a groundwater sink and conduit is considered improbable. Although a fault may in fact be present, the information on relative hydraulic gradients suggests that the fault would more likely be a zone of discharge to the overburden.

The bedrock groundwater monitors downgradient from the existing landfill have not revealed significant leachate impacts. However, SCAT's hydrogeologist believed that off-site leachate movement through bedrock fractures should not be easily dismissed. The extent of bedrock fractures is difficult to detect through a well-drilling programme. He commented on the existing information as follows:

Although the bedrock is often massive and is unlikely to transmit large amounts of water, significant water-bearing fractures were noted in borehole logs for monitor locations M9, M17, M23, M25, and M30. (Exhibit 184, p. 9)

... Most of the water is definitely going to be moving through the overburden, through ... sand and gravel deposits... they are also going to be carrying the greatest volumes of leachate away from the landfill ... maybe to beyond the property boundaries if we don't intercede ... some point soon. (Volume 48, p. 57)

Existing Leachate Plume

The existing site is located in a gravel pit. The absence of natural containment permitted leachate contaminants to drain quickly into the groundwater flow system and move relatively rapidly through the coarse gravel and sand deposits that lead south from the existing site.

Additional groundwater monitoring revealed the extent of the leachate plume emanating from beneath the existing landfill. The plume has travelled southward within the groundwater flow beneath the proposed extension area, under the Washburn Road, and into the groundwater discharge area of the proponent's buffer lands. The plume is approximately 300 metres wide and approximately 20 metres deep near the Washburn Road. The proponent's hydrogeologists have delineated the approximate horizontal boundaries of the plume in Map 4.

According to SCAT's hydrogeologist, the first chemicals that are likely to cause Reasonable Use exceedances are chloride, benzene, and diethyl ether. The following table was presented to illustrate this point (Exhibit 187, p31):

Table 4: Levels of Critical Contaminants

Chemical	M20-1	12-3	23-4	24-2	RUP Limit
Chloride (mg/l)	398	300	247	213	130
Benzene (ug/L)	3.7	2.8	3.3	1.1	1.25
Diethyl ether (ug/l)	89	81	62	323	150
Distance from Landfill	125	200	350	400	-
Distance to south property boundary	450	375	225	200	-

SCAT's hydrogeologist conceded that it is unlikely that Reasonable Use limits are currently being exceeded in the overburden to the north, south or east of the Laidlaw property. However, he felt there was insufficient information to make the same conclusion about the western property boundary. He noted that the levels at monitor M24 are already well above Reasonable Use. Monitor M24 is approximately 175 metres from the southwestern boundary of the proponent's buffer lands.

The water quality at the groundwater monitors located along the western property boundary indicate background water quality conditions (i.e. M14, M15, and M11). Given this evidence, the hydrogeologists for the MOE, Storrington Township and the proponent concluded that there is currently no leachate impact within the groundwater environment along the proponent's southwestern property boundary.

Mr. Bruce was concerned that leachate could migrate towards the Washburn wetland and the Rideau Canal through relatively permeable glaciolacustrine sand and silt layers that extend beneath the existing and proposed site. An eastward projection of the bedding slope of these layers indicates that they would emerge at the surface within the Washburn wetland.

Mr. Bruce noted that artesian conditions exist at monitors M5 and M6. These monitors are located between the existing site and the Washburn wetland. He suggested that some of the leachate draining from the landfill site could enter the more permeable silt and sand layers and eventually emerge as shallow groundwater discharge springs in the vicinity of the Washburn wetland. The preference of white pine trees for sandy soils and the existence of white pine trees in the Washburn wetland was offered as further support for this hypothesis.

Mr. Bruce also produced photographs showing holes and weaknesses in winter ice cover along the border of the Washburn Wetland and the Cataragui River. He believed these holes in the ice were due to the shallow groundwater springs. Several "windows" of darker and presumably less silty water were noted in the aerial photographs of a siltation event in the spring of 1991. One noticeable "window" was evident in a fairly sheltered indentation in the shoreline of the southwestern portion of the embayment. Mr. Bruce concluded that contaminated groundwater in the vicinity of the existing site could flow eastward through the shallow aquifer layers of silt and sand and enter the Washburn wetland.

The hydrogeologists for the proponent did not believe that Mr. Bruce's concern was supported by the existing information. They noted that the monitoring results confirmed a predominantly southward groundwater flow. However, the Board notes the absence of a monitoring well directly east of the northern portion of the existing Landfill area. The Board believes Mr. Bruce's astute observations warrant further monitoring to the east.

Future of the Leachate Plume

The proponent's experts testified that the closure and capping of the existing landfill has greatly reduced the amount of water percolating through the waste and generating leachate. However, SCAT's hydrogeologist predicted the continuation of significant contamination problems over the next 20 years. This is the probable time period for post-closure leachate to replace the stronger plume created by the two decades of pre-closure leachate generation.

According to SCAT's hydrogeologist, chloride levels have been rising over time at all depths at monitor M12 which is centrally located within the plume. Therefore, he concluded that the southern portion of the plume could continue to grow in both size and strength for a number of years. Based on the current average plume flow of 35 metres per year, it was predicted that the main body of the plume could reach the southern property boundary within the next several years. The MOE hydrogeologist agreed that the plume had not reached a steady state and it would continue to expand (Exhibit 163B, p. 13).

The proponent's consultants had originally predicted the complete emergence of the leachate plume within the groundwater discharge area. In this area, leachate contaminated groundwater upwells to create discharge springs and groundwater seeps into surface soils. However, the hydrogeologists for the MOE and SCAT indicated that a significant portion of the leachate plume was bypassing the groundwater discharge area. Once the plume bypasses the window of relatively leaky surface soils, the groundwater is trapped beneath a relatively impermeable surface soil and it continues moving towards the property boundaries and the Rideau Canal.

The hydrogeological information demonstrated that the plume was moving southward. However, the precise direction of the plume's movement south of Washburn Road was the subject of speculation. The proponent's experts believed the plume is travelling south to southeast. However, SCAT's hydrogeologist remained concerned about a potential southwest component to plume movement.

Contingency for Leachate Plume Capture

The proponent proposed to rely on monitoring to determine if natural dilution and attenuation processes would be sufficient to prevent off-site impacts. If contaminant concentrations were in danger of exceeding the MOE Reasonable Use limits at the property line, the proponent proposed a contingency plan.

The contingency plan involved drilling four wells into the leachate plume and pumping the contaminated water to a Leachate Treatment Facility or Marsh Treatment System for contaminant removal. The design of the purge well system would be adapted before and after installation to control the area of capture. The need for the purge well system would be determined by the results of the ongoing monitoring and the adoption of an appropriate trigger mechanism. The proponent proposed monitor M28 monitor as the key trigger point. If ongoing monitoring at M28 indicated a contaminant concentration above the Reasonable Use limits, then the proponent would install the purge well system.

In addition, the proponent would monitor wells M9, M11, M25, M26, M27, M29 and M30 for the following leachate indicator parameters: BOD; COD; benzene; toluene; ethylbenzene; xylene; conductivity; chloride; diethyl ether; alkalinity; and iron. Should a trend analysis indicate an increase of leachate concentration at any of these wells, the proponent would apply a trigger mechanism recommended by the hydrogeologist for the MOE.

The MOE hydrogeologist noted that the axis of the plume may not be travelling towards M28. He suggested an expanded trigger mechanism that relied on chloride measurements at all the boundary groundwater monitors. However, it was noted that contaminants other than chloride could cause a violation of Reasonable Use. SCAT's hydrogeologist amended the MOE's proposal to create the following trigger mechanism:

Step 1 If monitoring of any boundary groundwater monitor shows that the 60% Reasonable Use Policy (RUP) limit has been reached for any parameter, then quarterly sampling shall commence at that monitor.

- Step 2 If three consecutive exceedances of the 60% RUP limit are recorded for any parameter at any boundary monitor, or if the concentration of a parameter increases from 60% to 80% of the RUP in successive sampling events at any boundary monitor; then construction and testing of the purge well system shall commence.
- Step 3 If three consecutive exceedances of the 80% RUP limit are recorded for any parameter at any boundary monitor, then the purge well system shall be activated.

Before the Board and the public place their faith in the environmental protection afforded by a trigger mechanism, it is prudent to consider past experience. The Board heard abundant evidence from the public about the disparity between proposals and reality.

The Board notes that monitoring at the groundwater discharge spring revealed a noticeable rise in chloride levels and BOD in the November 1988 sampling results (Exhibit 20 p. 102). These results should have triggered additional drilling and sampling to determine the extent of the leachate plume. However, the proponent failed to undertake the required drilling until over three years later when the hearing was imminent. The Board has also observed significant differences in the interpretation of water quality monitoring. Therefore, the proponent and the MOE may have great difficulty utilizing future monitoring results to determine whether the purge well contingency has been triggered.

The Board has difficulty accepting the monitor, react and remediate approach that was recommended by the hydrogeologists for the proponent and the MOE. This approach was based on the MOE's guidelines for the Reasonable Use of groundwater. However, the reasonable use of the local groundwater includes the replenishment of surface water to the Storrington Swamp, the discharge stream, and ultimately the Rideau Canal. Therefore, the MOE's Surface Water Guidelines would be an important factor in the consideration of the need for the purge wells.

The proponent's experts acknowledged that a portion of the leachate plume is discharging to the surface water in the Storrington swamp. Benzene, diethyl ether and trichloroethylene have been detected at the discharge spring and the monitor 90 metres downstream. Diethyl ether has also been detected 450 metres downstream near the boundary with the adjacent private farmland. The level of trichloroethylene at the discharge spring is already near the proposed Provincial Water Quality Guideline of 2 ppb.

The Board accepts the evidence from the MOE and SCAT that the plume is growing in strength and size. The existing plume is only a few hundred metres from the southwestern property boundaries. The witness statement of SCAT's toxicologist noted the ecological and human health concerns with many of the leachate contaminants and commented:

The leachate contains a number of substances that are potential toxicants. The ones which are of concern are vinyl chloride and the other halogenated aliphatic compounds, as well as some of the aromatic hydrocarbons (benzene). The concentrations of these substances are relatively low and the potential for problems depends on how well the leachate is confined to the site. If these substances are allowed to migrate into the local waterways (Rideau canal system) and/or the local drinking water sources, then the potential for these substances to cause harm to the environment and humans increases

The entire purge well system would cost approximately one half million dollars. However, before an extension to the landfill is considered, the existing leachate plume must be properly mitigated. Therefore, two purge wells would have to be installed in the vicinity of the Washburn Road to avoid further degradation of groundwater and surface water. The installation of the remaining purge wells would be subject to the trigger proposed by SCAT's hydrogeologist. The timely installation of these wells would ensure that a proper pumping regime could be established to halt and preferably reverse the spread of the plume. Water from the purge wells would be pumped to the leachate treatment plant for contaminant removal.

The intervenors raised a number of issues regarding the purge well proposal. The four purge wells could produce several hundred litres/minute of contaminated water that would have to be treated and discharged. This volume, SCAT submitted, would require a substantial capacity increase for the proposed leachate treatment facility to effectively remove the organic and inorganic contaminants. SCAT also questioned the ability of the surface water drainage system (i.e. the discharge stream) to handle the additional flow of water from the treatment facility.

Purge Well Water Quantity and Quality

The proponent's consultants suggested that a combined pumping rate of 647 litres per minute (L/min) would permit the four purge wells to capture the leachate plume. The BOD concentration of the captured water was estimated by averaging the BOD values at monitors M12, M23 and M24. A BOD value of approximately 11 mg/L was estimated. SCAT's hydrogeologist questioned whether the water quantity and quality figures presented by the proponent's consultants were appropriate. For example, he noted that the BOD levels at M23-3 and M23-4 were approximately 20 to 30 mg/L.

The BOD concentration and volume of the purged water are important factors in the design of the proposed leachate treatment facility. After considering the evidence and the COD values for M-23 and M-24, the Board believes that the following values would be appropriate for the first phase of the purge well system: a maximum pumping rate from the two wells of 400 L/min; and a design BOD concentration of approximately 20 mg/L.

PROPOSED EXTENSION

Leachate Containment Liner

The area of the proposed Landfill extension is not completely lined with layers of native clay. Therefore, a portion of the native clay layers in the eastern portion of the proposed extension would be used to construct a clay liner beneath the entire extension area. A series of 15 centimetre layers of clay would be compacted to achieve a relatively impermeable 1.5 metre thick leachate containment barrier. The design hydraulic conductivity would be one-billionth of a metre per second (1×10^{-9} m/s). A compacted clay sidewall liner would also be constructed to prevent leachate from escaping laterally into the surrounding soils.

SCAT's hydrogeologist commented on the proposal as follows (Volume 48, pp 118-119):

Laidlaw has, of course, changed the undertaking in a dramatically and from my perspective in a positive way. They are planning to line the new site, collect leachate and treat it.

The good news, I guess, is that the [liner and leachate collection] will ... actually help the [existing plume] situation, because we are likely to see ... a slight convergence of flow towards the [Laidlaw] property from neighbouring properties

The MOE expert, Mr. Paul Nieweglowski, testified that the conceptual design of the proposed clay liner was consistent with recent MOE requirements. However, the MOE requested thorough quality assurance prior to and during liner construction to demonstrate actual liner performance. This concern was partially attributable to the proposed use of a fairly chemically inert quartz-derived clay material. The local material is "clay sized" rather than mineralogical clay. The MOE wants to ensure that the proposed design parameters (eg. hydraulic conductivity) can be achieved to minimize leakage.

Mineral clay can adsorb contaminants through ion exchange and precipitation/dissolution reactions. One of SCAT's consultants, Mr. Yardley, noted that the quartz-derived clay particles will not have these same properties. Therefore, he predicted a lower attenuation potential, a reduced self-repair property, and a greater leakage rate for the proposed liner material.

The proponent's expert, Mr. Harding, calculated a liner leakage rate of approximately 280 m³/yr. This amounts to approximately 1% of the peak leachate generation rate. The amount of leachate that is currently recirculated at the existing site is approximately 300 m³/year. The proposed extension would stop the re-infiltration of this leachate and divert it to the leachate treatment plant. Therefore, the proponent's experts submitted that the extension would not increase the volume of leachate escaping to the groundwater flow system.

The consultants for SCAT also calculated the rate of liner leakage. They calculated a leakage rate of at least 11% (3100 cubic metres/year). This estimate corresponded to an earlier calculation of leakage performed by the proponent's consultants (Exhibit 20, p. 112). SCAT's hydrogeologist estimated that leachate would take approximately two decades to pass through the liner, if the design specifications were achieved. He indicated that leachate leakage from the proposed extension would have a greater probability of entering the shallow groundwater flow system and emerging as groundwater discharge in the Storrington swamp.

The hydrogeological models that are used to calculate liner performance contain many assumptions and uncertainties. Given these uncertainties, the Board believes that it is prudent to anticipate a potential liner leakage rate of at least 11%.

The proponent's consultants noted that additional layers of natural clay provide further protection in the eastern half of the site. However, leachate that passes through the constructed clay liner in the western portion would enter the groundwater flow system and flow in a southerly direction through the proponent's property. The proponent's experts concluded that natural attenuation and dilution should be sufficient to prevent off-site impacts. They noted the extensive groundwater monitoring network and suggested that ongoing monitoring would alert the proponent to any significant leachate movement in time to take preventative actions.

Mr. Yardley agreed with the MOE that the following requirements should be met prior to the final approval of the liner: preparation of detailed design and construction plans; laboratory leachate compatibility testing; laboratory and field compaction and hydraulic conductivity testing; on-site quality assurance control and testing to demonstrate the attainment of the design criteria for compaction and hydraulic conductivity; and the development of contingency plans.

The Board has considered: the MOE's conditions for liner testing and approval; the prevailing groundwater flow beneath the liner; the proponent's sizeable buffer lands in the direction of the groundwater flow; and the ability to capture liner leakage through purge wells. The Board is satisfied this component of the proponent's proposal is adequate, if the design hydraulic conductivity can be achieved.

Leachate Collection

Details regarding the proposed leachate collection system were presented through the evidence of David Harding (Exhibits 64 and 64A). The leachate collection system would collect the water infiltrating through the waste and channel it to a leachate sump for transmission via a forcemain to a leachate treatment facility. The original leachate collection system entailed a perimeter collection pipe around the base of the landfill. Design upgrades were made in the summer of 1991 to improve leachate collection efficiency.

A full underdrain leachate collection system was proposed at the hearing. The revised leachate collection system included the following basic components: a drainage layer of aggregate above the liner; a perimeter and underdrain pipe network consisting of perforated laterals, headers and clean-outs; filter cloth (geotextiles) separating various system components; a protective soil cover layer; and a leachate collection and transmission sump.

The underdrain pipes would follow V-shaped channels on the top of the clay liner. Regularly spaced channels would slope at a grade of 2% towards the perimeter leachate collection pipes and the entire landfill base would slope 0.5% towards a leachate sump at the northeast corner of the proposed extension.

The Ministry of the Environment officials were satisfied with the general design of the leachate collection system. On behalf of SCAT, Mr. Yardley raised several concerns:

- the potential clogging of the collection system due to the formation of a biological and/or sediment film on the filter cloth covering the aggregate layer;
- the need to slope the filter cloth toward the perimeter leachate collection pipes to ensure proper leachate drainage in the event of filter cloth clogging;
- the need to delete the filter cloth strip immediately above the leachate collection pipes to increase drainage;
- the need for a leachate depth monitor in the northeastern central area of the landfill; and
- the need to use chemical resistant HDPE piping that can withstand the anticipated loadings.

After considering the evidence and the proposed Conditions of Approval, the Board concludes that the leachate collection component of the proposed undertaking would be satisfactory if the aforementioned refinements recommended by SCAT are implemented.

Leachate Sumps

A shared leachate sump was proposed for the existing site and the extension. However, the design elevations for the leachate pipe inlets would permit leachate to flow back into the existing landfill under certain conditions (eg. pump failure, rapid leachate rise). SCAT's consultant recommended two separate sumps to prevent this occurrence and to allow independent monitoring of leachate quantity and quality from the old site and the extension area.

The Board has reviewed the groundwater surveys for 1986 and 1987 (Table 7, Exhibit 20). These surveys show significant groundwater contamination at shallow monitors 2S, 3S and 6-1. This contamination was attributed to problems with the leachate collection system and pumps.

Leachate backflow into the leachate collection system for the existing site could cause a recurrence of these problems and increase the risk of leachate escape to surface or groundwater. Therefore, a separate leachate sump would be required for the proposed extension.

Leachate Forcemain

The proponent proposed to pump the leachate from the sump(s) to the leachate treatment facility. The proposal involved a two pump system and a high level alarm that would alert the Laidlaw via telephone if the level rose too high. The Board expects this proposal would be applicable to separate sumps.

The proposed leachate forcemain would be a pipe housed within a second larger pipe. There was little discussion about the proposed forcemain. Therefore, the Board accepts this component of the proposal. The Board expects that the pipe would be routed and buried to avoid accidental construction damage and leachate heat loss.

Marsh Treatment of Contaminated Groundwater and Leachate

Originally, the proponent had proposed a marsh treatment system (MTS) for the treatment of leachate contaminated groundwater. The proposal would involve the excavation of a 1.5 kilometre serpentine wetland channel in the Storrington cedar swamp south of Washburn Road. The channel would be vegetated with native cattail communities to imitate the natural water purification processes of a marsh.

After consulting with the experts for the other parties, the proponent agreed to use an enclosed biological treatment process (Rotary Biological Contactor) as the primary leachate treatment method. However, the proponent had already completed and naturalized a U-shaped portion of the marsh treatment system and the MOE had approved a pilot project to test its treatment efficiency. The pilot test would evaluate this treatment system's ability to decontaminate groundwater that contains dilute leachate from the existing site.

The *OWR Act* application for the marsh treatment system was not referred to the Board for approval as a part of the *EA Act* hearing. However, the hearing evidence has convinced the Board that the *OWR Act* issues are an important factor in the Board's deliberations. The Board received abundant evidence on these matters and the purpose of the *EA Act* would not be fulfilled, if the Board failed to address the important issues that were raised.

The MOE expert on marsh treatment systems was Dr. Manoharan. His witness statement noted (Exhibit 161A):

The recent interest in aquatic wastewater systems can be attributed to the recognition of the natural treatment functions of aquatic plant systems/wetlands and their low construction and operational costs. The treatment is accomplished by physical, chemical and biological processes which include sedimentation, filtration, precipitation, adsorption, decomposition, and bacterial and plant metabolism and assimilation

According to the proponent's summary of the undertaking, another pilot project would also be undertaken. This pilot project would test the ability of the constructed marsh to treat raw leachate. The proponent hopes to demonstrate that the marsh channel system can effectively treat leachate from the proposed landfill. If the pilot test on leachate treatment yields favourable

results, the proponent would apply for the necessary *OWR Act* approvals to use the MTS to treat raw leachate. However, the proponent does not propose to employ the MTS as the primary leachate treatment method until at least four years after the commencement of the receipt of waste at the landfill extension.

The marsh treatment system discharges into a small stream that empties into the Rideau Canal several hundred metres downstream. Environment Canada's (Parks Canada) mandate encompasses the Rideau Canal. An Environment Canada biologist, Mr. Carreiro, criticized the Marsh Treatment proposal as follows:

- leachate contaminants could bioaccumulate and bioconcentrate within the food chain and this could eventually affect the survivability and reproductive success of the creatures that frequent the marsh and the discharge stream;
- ammonia levels from the treated leachate could still exceed levels that are toxic to fish and other aquatic organisms, particularly during the winter when the bacteria that treat ammonia are often dormant;
- the ability to distinguish between the effects of dilution and the removal of contaminants by the marsh community would be difficult, if not impossible, due to diffuse groundwater upwelling in the MTS area; and,
- the finite assimilative capability of the Marsh could be overwhelmed after a relatively short period and therefore treatment efficiency could significantly decline over time.

SCAT's toxicologist supported Mr. Carreiro's concern about the potential for bioaccumulation and bioconcentration. Dr. Racz noted a number of problematic substances that are commonly detected in landfill leachate (eg. halogenated aromatics, lead and other heavy metals, phthalates from plastics). He testified that these substances have implications for human and ecosystem health. The MOE expert, Dr. Manoharan, supported the concerns of Mr. Carreiro regarding ammonia removal efficiency during winter, dilution versus treatment, and the finite ability of the wetlands to effectively remove contaminants.

The minimum temperature requirement for the bacterial activity that removes ammonia is 6 C. The proponent's consultants estimated that 10⁰ C groundwater discharges to the bottom of the wetland channels. Therefore, they expected bacterial ammonia removal to continue during the winter. The proponent's consultants also expected volatilization of some of the organic contaminants in the leachate.

The Board believes the witnesses for the MOE, Environment Canada and SCAT have identified serious weaknesses in the purposeful introduction of leachate into the MTS. Some of the contaminants in the leachate have suspected reproductive, health, and behavioural implications for organisms at various levels of the food chain, including man. The wetlands and waterways surrounding the proposed site are frequented by a variety of fish and wildlife, including migratory waterfowl. The purposeful introduction of leachate contaminants into the constructed wetland would increase the risk of contaminant bioaccumulation and bioconcentration in local fish and wildlife. Fish and waterfowl form an important food source for many non-urban Canadians, particularly native people. The potential cumulative impact on fish, wildlife and people must be considered.

The Board also has concerns about the use of the MTS for the removal of volatile organics. The removal of volatile organic compounds through evaporation merely transfers the contaminant from one media (water) to another (air). The ultimate environmental fate of these volatilized organic compounds was not satisfactorily presented.

The leachate contaminated groundwater that is emerging in the Storrington swamp is already utilizing the natural assimilative capacity of the existing wetland soils. The construction of additional treatment channels would further disrupt the natural Storrington Swamp and could release soil bound contaminants to the surface water system. The purposeful addition of leachate could further contaminate the underlying soil and reduce the area's natural attenuation capacity. If the extension is approved, long term attenuation capacity may be needed to treat any leachate that leaks through the extension area's liner and escapes the purge well capture system.

One of the most compelling problems with the proposed marsh treatment system is its location and outflow. A permanent stream drains the marsh treatment and groundwater discharge area. This stream flows onto private property and into the Rideau Canal a relatively short distance downstream. The relatively rapid flow of the stream beyond Laidlaw's property would make it very difficult to detect and contain water that does not meet the provincial water quality objectives.

The downstream landowner, Mr. Campbell, testified that the local spring water was once so pure that he would drink it when he was working nearby. If leachate contaminants are purposefully introduced to a constructed wetland at the headwaters of the discharge stream, Mr. Campbell could have legitimate concerns about the future implications of using the stream water for cattle or crops.

The Board readily acknowledges that the innovative reproduction of natural ecological processes could be useful for treating certain wastewaters (eg. stormwater, sewage). However, the Board has noted the following crucial factors: the contaminant characteristics of the wastewater; the degree of bioaccumulation and bioconcentration; the efficiency of the treatment process; the location and natural function of the treatment area; the path of the discharge; downgradient water uses; and the sensitivity of the receiving water body.

Leachate contains numerous organic chemicals that have suspected ecological and human health implications. Furthermore, the proposed treatment area is in an existing wetland that drains via a permanent stream. This stream crosses private farmland before discharging into a sensitive (PWQO Policy 2) receiving water body, the Rideau Canal. The Board concludes that the purposeful introduction of landfill leachate into the constructed wetland would not meet the *EA Act's* purpose of providing for the protection, conservation and wise management of the environment. Therefore, an enclosed leachate treatment process would be necessary throughout the contaminating lifespan of the site.

Proposed Leachate Treatment Plant

An enclosed leachate treatment plant is proposed in the area south of Washburn Road on property owned by the proponent. The proponent proposes to use a Rotating Biological Contactor ("RBC") to treat leachate. The RBC system is an aerobic, fixed film reactor. It uses naturally occurring micro-organisms to degrade organic leachate contaminants and to remove inorganic substances from leachate. Odours and volatile gases can also be contained and treated within the enclosed RBC unit(s).

The RBC system contains numerous disks that are approximately three metres in diameter. Hundreds of disks can be spaced a few centimetres apart to create a very large surface area within a relatively small enclosure. The disks are spaced along a shaft and they slowly rotate in a trough containing the leachate. A "biofilm" of microorganisms forms on the large disk surface areas and the rotation of the disks alternately exposes the "bio-film" to leachate and air. When the microbes are submerged in the leachate they absorb contaminants. When the microbes are exposed to the air they absorb oxygen and metabolize (biodegrade) the contaminants.

RBC technology has been used successfully for wastewater treatment in a number of places in Canada and worldwide. The Britannia landfill site in Peel has been using two RBC units to treat leachate since the beginning of 1992. The Board and several of the parties visited the Britannia RBC facility and reviewed the characteristics of the untreated (influent) and treated (effluent) leachate. The initial results from Britannia and other landfill sites have been encouraging.

The main phases of leachate treatment would be: removal of organic material (BOD) in the lead RBC stages; oxidation (nitrification) of ammonia in the latter RBC stages after BOD levels decline to below 15 mg/L; effluent filtering with a buoyant upflow gravity self-cleaning filter; sludge concentration with an aerobic digester; and additional treatment to remove phosphorus.

RBC units are commonly sized according to the expected BOD and ammonia loadings (concentration x volume). Established kinetic equations are used to determine the surface area required to assimilate the influent contaminant loadings and achieve the required effluent quality. Biological oxygen demand (BOD) is a measure of the depletion of the oxygen content of wastewater due to the oxidation of the organic material it contains. If effluent has a BOD level higher than 15 mg/L it can harm aquatic ecosystems by oxygen depletion.

The PWQOs indicate that un-ionized ammonia should not exceed .02 mg/L for the protection of aquatic life. This translates into maximum allowable total ammonia concentrations of 1.7 mg/L in summer and 3.0 mg/L in winter. Thus, the following effluent design criteria were chosen: BOD - less than 15 mg/L; ammonia less than 1.7 mg/L in summer and less than 3.0 mg/L in winter. These effluent criteria were not challenged by the parties. The proposed RBC system was based on an ammonia surface loading rate of approximately 1 gram ammonia per square metre per day (i.e. 1 g/m² day). SCAT's wastewater expert agreed with this proposed ammonia surface loading. However, he noted that the preliminary BOD removal stage must be working properly and the precipitation of inorganics must be prevented.

The RBC facility would require an *OWR Act* approval from the MOE. Mr. Henry Kronis of the MOE Water Resources Branch provided evidence on RBC technology. He concluded that a properly designed RBC facility could effectively treat leachate BOD and ammonia levels to satisfy the relevant Provincial Water Quality Objectives. He noted that the RBC would also reduce organic contaminants and metals.

SCAT's consultant's also agreed that a properly designed RBC system could effectively remove leachate contaminants. However, the following issues emerged at the hearing:

- the probable BOD mass loadings based on predicted leachate concentrations and volumes;
- the design criteria for the mass loadings of BOD and the resulting sizing of the RBC disk surface area;
- the potential need for pretreatment to adjust pH and prevent precipitate (carbonate) build-up on the disks;
- the potential need for supplemental heating to ensure that low winter temperatures do not reduce the treatment efficiency; and
- the need to enlarge the aerobic/digestion system if design BOD concentrations increase.

RBC Temperature Maintenance

The rates of the biological and chemical processes that occur within an RBC are temperature dependent. For example: the bacterial nitrification of ammonia virtually ceases below 6°C. The proponent's RBC expert indicated that the system was designed to operate effectively down to a minimum temperature of 8°C. The RBC units would be insulated to minimize heat loss and the leachate would arrive via an underground forcemain.

The proponent's hydrogeological experts testified that the temperature of the leachate from the existing site was approximately 15°C in the winter. Apparently some of the chemical reactions that occur in the leachate and the RBC generate heat (exothermic). The proponent's experts did not envision a requirement for heat control within the RBC units. However, the expert for the MOE believed that supplementary heating may be necessary to maintain an adequate influent temperature in the winter. If the influent temperature dropped too low, the treatment efficiency (eg. ammonia oxidation) could be significantly impaired.

The Board believes that the MOE's concern is warranted. The Board notes that the leachate would have to be piped a few hundred metres from the proposed leachate sumps to the proposed treatment facility. Some heat loss is probable during piping and flow control. The effectiveness of the treatment process is very temperature dependent. Therefore, the design of the leachate treatment facility would need provisions for temperature monitoring and supplemental heating to maintain the temperature in the RBC units above 10 C.

Pretreatment

SCAT's wastewater expert recommended a pretreatment process for the precipitation of inorganic compounds. He was concerned that calcium and iron precipitates could accumulate on the RBC disks and reduce the effectiveness of the biological treatment processes. The Board also heard evidence on the importance of pH. Apparently, the formation of precipitants on the disk surfaces is more prevalent at high pH and pH levels tend to increase as the RBC treatment progresses.

The Britannia RBC system had an influent pH of approximately 7 (neutral), however, the effluent pH was approximately 9. At this high pH, nitrification appeared to be suppressed, and ammonia removal occurred primarily through stripping into the surrounding air. There is good evidence that pH adjustment may be needed. The Board believes the evidence was inconclusive on the need for other forms of pretreatment. However, a good RBC design would be readily adaptable to the installation of a pretreatment system and other measures for preventing the formation of precipitates.

Probable Leachate BOD Loadings

Influent mass loadings are dependent on the volume and concentration of the leachate. The proponent's consultants predicted a maximum leachate generation rate of approximately 28 million litres per year (approximately 17,000 gallons per day). This figure was not seriously disputed. The leachate from the existing Storrington site had been sampled for several years. The proponent's consultants concluded that the Storrington Landfill leachate is relatively weak in comparison with other landfill leachate. After considering the average leachate BOD concentration from the existing site, a design BOD concentration of 270 mg/L was recommended.

The consultants for SCAT, Mr. Lugowski and Mr. Yardley, disagreed with the aforementioned prediction of leachate BOD concentration. Mr. Lugowski stated (Exhibit 199):

It is highly probable that the new site will generate leachate at BOD concentrations between 1000 - 5000 mg/L for several years Therefore, the projected organic loading should be based on a BOD₅ concentration of at least 3000 mg/L. It is very likely that the acidification stage will last for several years producing leachates with even higher loadings.

Mr. Yardley agreed that the BOD concentration of the proposed extension would probably exceed 5000 mg/L during the initial few years. The leachate BOD concentrations for a number of landfills in Ontario were cited to support this conclusion (Exhibit 186, Table 5.1).

The MOE's expert, Dr. Manoharan, also disagreed with the BOD concentration predicted by the proponent. Only a small portion of the existing landfill is lined and the leachate is collected via a perimeter pipe system. The proposed extension would be completely lined and underdrained by a full leachate collection system. Dr. Manoharan concluded that it would not be prudent to predict the leachate BOD concentration for the proposed extension based on the sampling from the old landfill site. After considering other landfill BOD concentrations, he recommended an RBC design criteria of 1000 - 2000 mg/L BOD. In final argument the MOE submitted that a design criteria of 2000 - 3000 mg/L BOD would be appropriate.

The proponent submitted that it is very difficult to predict levels of concentration of BOD. Although it was acknowledged that the design criteria for BOD may be low, the design criteria for volume and ammonia were for peak levels. The proponent's consultants also asserted that when leachate volumes would be high, the concentration of the leachate would probably be lower. Therefore, the overall mass loadings would not necessarily exceed the treatment capacity of the RBC system.

The proponent's RBC consultant, Mr. McKim, noted that the RBC system consists of a number of units. Leachate can be directed to the units in sequence or in parallel to adapt to different influent flow rates and concentrations. He also noted that the microorganism populations are able to grow or shrink fairly quickly in response to changes in BOD loadings.

SCAT's wastewater consultant also challenged the design BOD surface loading rates for the initial stages of the RBC treatment process. The first phase of the proposed RBC system was designed for a surface loading value of approximately 31 grams BOD per square metre day ($\text{g/m}^2 \text{ day}$). The Board was referred to a manual entitled: *Design of Municipal Wastewater Treatment Plants, WEF Manual of Practice #8 (1992)*. This manual recommends that organic surface loadings to the first treatment stage should not exceed 31 grams of total BOD $\text{g/m}^2 \text{ day}$ or 12 grams of soluble BOD $\text{g/m}^2 \text{ day}$, whichever is more stringent. SCAT's consultant testified that soluble BOD can comprise more than 75% of total BOD. Therefore, he recommended first stage BOD surface loadings of 12 $\text{g/m}^2 \text{ day}$.

Based on his experience working with wastewaters with approximately 90% soluble BOD, Mr. McKim testified that a design criteria based on total BOD (i.e. 31 $\text{g/m}^2 \text{ day}$) was satisfactory. He also indicated that the following RBC design features mitigate against first stage overload:

diffusers or spargers in the bottom of the trough to increase dissolved oxygen and to scour excess growth from the RBC disks; two rotational speeds to adjust sheering of excess surface growth and to regulate surface renewal; and the use of an influent header device to permit the distribution of influent flows amongst the first three RBC stages.

According to Mr. McKim, the design criteria were conservative and appropriate for the leachate concentrations provided by the proponent. He also indicated that the groundwork and piping network for the initial RBC facility could be designed to readily accommodate future capacity upgrading. The proposed design for BOD removal involved two low density RBC units, each with a disk surface area 50,000 square feet. The proposed design for ammonia removal involved two high density RBC units, each with a disk surface area of 171,000 square feet. The proponent indicated that a part-time operator would be required to monitor and control the RBC system. Mr. McKim suggested that the necessary operational duties could be accomplished in few hours each day.

Mr. McKim testified that the two proposed low density units could probably handle influent BOD levels of up to 1500 mg/L before experiencing serious first stage overload. However, he indicated that monitoring and control of the treatment process would become more critical as the BOD levels approached 1500 mg/L. If BOD levels were 3000 mg/L, an additional 100,000 square feet of disk area would be required for BOD removal. Mr. McKim indicated that economies of scale factor into the cost of RBC units. Therefore, the cost of two 100,000 square foot units would be only 50% more than the cost of two 50,000 square foot units. The estimated cost of two 50,000 square foot units for BOD removal was approximately \$450,000. Therefore, the approximate cost of two 100,000 square feet units would be \$675,000.

The proponent did not want to incur additional up-front costs before it was proven that the extra capacity would be necessary. If the actual BOD levels were to exceed the RBC treatment capability, additional units could be manufactured and installed in a relatively short period of time. Leachate could be either temporarily stored in the leachate collection system or trucked to the Kingston Township Water Pollution Control Plant pending the RBC capacity upgrading.

The Board acknowledges the proponents interest in avoiding "unnecessary" costs associated with the design of the treatment facility. However, the Board also recognizes the crucial importance of protecting the surface water quality in the groundwater discharge area from further cumulative

impacts. The existing leachate plume is already emerging in the discharge area. The effluent from the RBC would drain into the Storrington Swamp discharge stream and cross private farmland before emptying into the Rideau Canal. An under-designed RBC system could seriously undermine the ability to consistently produce an effluent that would prevent deleterious impacts to surface water quality within and beyond the proponent's property boundaries.

The proposed leachate treatment system was estimated to cost over \$2.6 million. The Board notes the cost estimate contained in the document attached to the Supplementary Agreement (May, 1991) for waste disposal services between the City of Kingston and the proponent. This document (proforma) allows Laidlaw to adjust tipping fees in accordance with certain hearing and approval related expenses. The document specifies \$5 million for a rotary biological leachate treatment process. Furthermore, the proponent's RBC consultant indicated that certain economies of scale exist in the cost per unit treatment area. Therefore, the cost of immediately constructing the system with larger capacity would be less than the cost of retrofitting to achieve that same capacity.

Under-designing the system and then storing or trucking the leachate involves a number of environmental risks. If the RBC unit is shut-down and the leachate is stored on the liner, the rate of leakage could increase. Trucking the leachate to the Water Pollution Control Plant uses additional energy and increases the risk of spillage or the overloading of the Water Pollution Control Plant. In addition, if the RBC system is always straining to operate at capacity, the margin for operator error is reduced and the chance of poor quality effluent is increased.

The Board recognizes that the reduced landfill capacity (i.e. 600,000 tonnes) considered by the Board would result in a reduced landfill footprint and therefore a reduced rate of leachate generation. However, the RBC design is based on averaging the maximum yearly leachate production over 365 days. This average value may not reflect seasonal peaks in leachate production. SCAT's consultant predicted a potential leachate volume of 3.3 million litres per month (39.6 million L/year) during the first several months of landfill operation. Therefore, the predicted rate of leachate generation should not be significantly reduced in response to the reduced landfill capacity.

The Board believes that the following design criteria would be necessary to provide reasonable operational tolerances and effective leachate treatment:

- a leachate flow rate of approximately 28,000,000 L/year;
- a leachate concentration of 3000 mg/L total BOD and a first stage loading of less than 31 g/m² day total BOD;
- a leachate concentration of 400 mg/L total ammonia and a surface loading of 1 g/m² day total ammonia;
- the provision of supplementary heating that is acceptable to the MOE;
- the ability to manage pH and prevent precipitation problems, including design allowances for the easy addition of a pretreatment system if it becomes necessary; and
- the ability to handle a BOD concentration of 20 mg/L and a flow rate of 400 L/min from the purge well system.

Phosphorous is a required nutrient for the abundant growth of the RBC microorganisms that absorb and oxidize the contaminants in the leachate. Phosphorus levels in the raw leachate are relatively low and therefore the addition of phosphorous (phosphoric acid) would be necessary for the effective functioning of the proposed RBC treatment plant. The effluent from the RBC would have an approximate phosphorous content of 0.35 mg/L. This exceeds the limit prescribed by the Provincial Water Quality Objective which is .02 to .03 mg/L. Therefore, further treatment of the RBC effluent would be required to reduce the phosphorus levels to meet the PWQO.

Phosphorus Removal

At the beginning of the hearing, the proponent's counsel submitted that the proposed undertaking would meet or surpass the relevant MOE policies and guidelines. Two of the policies mentioned were the "Reasonable Use" guidelines for groundwater protection and the Provincial Water Quality Objectives for surface water protection. Therefore, the RBC effluent would have to be treated to reduce the levels of phosphorus.

The proponent's RBC consultant also introduced evidence on a tertiary treatment system for phosphorus removal. The tertiary treatment system would take the effluent from the RBC and direct it to a special reactor vessel called a Claricone. Chemical polymers and alum would be added to the reaction vessel to form precipitates and colloids with the phosphorus and then the resulting particulates settle. The effluent from this process would then pass through a dual media filter to remove the residual phosphorus solids. After the dual filter process, the effluent would pass through an alumina carbon absorber that removes additional phosphorus.

The relevant MOE expert on this matter was Mr. Kronis. According to Mr. Kronis, if the proposed tertiary treatment system was properly calibrated, operated and maintained, it could consistently produce an effluent that meets the stringent requirements of the PWQOs. In addition to removing phosphorus, the tertiary treatment would also remove heavy metals that can be toxic to some aquatic organisms. Mr. Lugowski, a consultant for SCAT, agreed with the conclusions of Mr. Kronis. However, he noted that the proper performance of the tertiary treatment system was premised on the RBC unit meeting its effluent design criteria.

The proponent submitted that an *OWR Act* application was being prepared for the approval of a parallel pilot-test of the MTS. This test would evaluate the marsh system's ability to remove phosphorus from the RBC effluent to meet the PWQOs. According to the proponent, the million dollar tertiary system would not be required pending the results of the proposed pilot project.

On behalf of the MOE, Dr. Manoharan provided evidence regarding the ability of marsh systems to remove phosphorus. He noted the following points: the existing scientific literature indicates that marsh treatment systems do not remove phosphorus to the levels established by the PWQO; the primary mechanism for phosphorus removal at concentrations of less than 1 mg/L is chemical absorption onto sediments; the ability of sediments to absorb phosphorus is limited and therefore treatment efficiency declines after a few years; and lower winter temperatures reduce the chemical precipitation/adsorption reactions that remove phosphorus.

Dr. Manoharan considered the available experimental results and the information provided by the proponent's consultants. He concluded that the MTS would be unable, in all probability, to consistently reduce the phosphorus levels in the RBC effluent to meet the PWQO. SCAT's wastewater consultant agreed with this conclusion.

The Board acknowledges the potential for utilizing constructed marsh treatment systems to remove excess nutrients. Phosphorus is a primary plant nutrient that could, in appropriate amounts and circumstances, have a beneficial impact on growth and productivity in some plant communities. However, the evidence of the MOE's surface water expert, Mr. Reeves, indicated that the Rideau Canal already contains phosphorus levels that are above the PWQO. These elevated phosphorus levels have been demonstrated to cause adverse aquatic ecosystem impacts such as nuisance algal growth, weed problems and oxygen depletion.

The proponent noted that the RBC effluent may be sufficiently diluted to approach the PWQO, if leachate contaminated groundwater from the existing site was treated by the RBC. The Board believes that dilution is not the solution. The net change in phosphorus loadings to the Rideau canal must also be considered. If the extension is approved, the expanded site will capture up to 28 million litres of leachate that will require phosphorus addition and eventual discharge towards the Rideau Canal. Even if the RBC effluent meets the PWQO, this is a significant potential increase in the actual mass loadings of phosphorus to the discharge stream and the Rideau Canal.

Phosphorus levels in the Rideau Canal already exceed the PWQO. Therefore, the MOE's surface water management policy requires the consideration of all reasonable and practical measures to reduce waste loadings. If new or expanded discharges are proposed, further degradation of water quality is not permitted.

The existing evidence does not support the MTS's ability to reduce phosphorus loadings by the required amount. The Board heard substantial evidence that the tertiary treatment system is a practical and effective measure for removing phosphorus. The Board also heard evidence that the tertiary treatment system increases the efficiency of heavy metal removal. Therefore, the installation of the tertiary treatment system would be required to provide a practical and proven method for producing an effluent that meets the PWQO.

Contingency Trucking of the Leachate to the Kingston WPCP

The proponent identified a contingency for the RBC system. This contingency involved the trucking of leachate to Kingston Township's Water Pollution Control Plant (WPCP) for treatment. Counsel for the Township, Mr. P. Swan, filed a letter with Board with the following relevant comment (Exhibit 171):

This will confirm that the Township of Kingston is satisfied that accepting leachate for treatment at the Township of Kingston WPCP will not adversely affect the Township's ability to provide satisfactory present day treatment service, and also to accommodate reasonably foreseen development.

The proponent's expert on this matter was Mr. S. Black. He conducted a desk-top analysis of the potential impact of the additional waste loadings on the functioning of the WPCP (Exhibit 150). The analysis was based on the handling of two or three 8000 gallon tanker trucks each day with an average leachate BOD concentration of 240 to 663 mg/L. Mr. Black concluded that the WPCP could handle this loading but its aeration ability would be marginal.

SCAT's wastewater consultant commented on this contingency as follows:

Considering the plants limited oxygen capacity and the likelihood of ten times higher organic loading, it is highly unlikely that the plant processes will not be upset during the leachate discharge. The high ammonia associated with the leachate treatment would contribute to higher effluent toxicity since the wastewater treatment plant is not designed to nitrify.

The Board believes the aforementioned comments have merit. The Board has previously concluded that the BOD loadings from the proposed extension are more likely to be in the 1000 to 5000 mg/L range. Therefore, the already marginal aeration capacity at the Kingston Township WPCP would be overloaded and the quality of the effluent would be reduced. Counsel for the MOE suggested that the timing and rate of leachate discharge to the plant could be adjusted to reduce the impact of higher leachate BOD loadings. In addition, Kingston Township is currently planning to upgrade the WPCP.

The Board concludes that the WPCP plant does not have the capacity to properly aerate and treat the probable leachate contaminant loadings unless; the plant's aeration and treatment capacity is significantly upgraded, or the timing and rate of leachate discharge is adjusted to occur during several hours of off-peak loadings.

Groundwater Monitoring

The hydrogeologists for the proponent and the other parties agreed with the groundwater monitoring programme outlined in the witness statement of Storrington Township's hydrogeologist (Exhibit 182). SCAT's hydrogeologist made the following additional recommendations:

- any groundwater monitors included in the monitoring program should be replaced if they are not functioning adequately to allow the required sampling;
- plugged groundwater monitors M13, M14 and M18 should be replaced;
- groundwater monitors M8-2, M9-1 and M9-2 should be included in the semi-annual monitoring program (and sampled for the full list of indicator parameters) if chloride levels at any monitor increase to 75 mg/L; and
- additional multilevel groundwater monitors should be installed on the east side of the landfill between M22 and M5 and on the west side of the landfill between M11 and M9.

SCAT's hydrogeologist indicated that the implementation of the aforementioned recommendations would ensure adequate overburden monitoring for both the existing landfill's contamination plume and any contamination plume from the proposed landfill extension. The Board agrees that monitoring gaps near the west, southwest and northeast boundaries warrant further monitoring.

The monitoring programme included the following leachate indicator list (L.I.L.) that would be analyzed: chloride; alkalinity; conductivity; BOD; COD; iron; benzene; toluene; ethylbenzene; xylene; and diethyl ether. The Board notes that landfill leachate often contains heavy metals that can be toxic to some aquatic organism at very low concentrations. Dilute leachate from the existing site is already emerging at the discharge stream and the effluent from the leachate

treatment facility could also drain into the discharge stream. Therefore, groundwater monitoring for heavy metals (eg. lead, copper, cadmium, mercury) would be warranted to ensure compliance with the PWQO.

BOARD CONCLUSIONS ON GROUNDWATER IMPACT ASSESSMENT

The existing site is largely unlined and therefore leachate has leaked into the underlying groundwater flow system for approximately two decades. The resultant leachate plume has provided empirical evidence regarding local groundwater flow and contaminant movement. Groundwater flow beneath the existing and proposed Landfill area directs leachate contaminants towards the proponent's buffer lands to the south of Washburn Road. A portion of the groundwater flow upwells within these lands and emerges as diffuse groundwater discharge and springs within the Storrington Swamp.

The evidence indicates that the capping and closure of the existing site has significantly reduced water infiltration and leachate production. It took approximately two decades for the plume to reach its current position south of Washburn Road. Therefore, SCAT's hydrogeologist predicted a similar period before the more dilute plume now emanating from the closed and capped landfill would replace the existing plume.

The eastern portion of the proposed extension is lined with native clay. The proponent proposes to use clay from this area to construct an engineered clay liner beneath the entire extension area. SCAT's engineering consultant testified that approximately 11 percent of the leachate from the proposed extension would eventually leak through the liner and into the groundwater flow system. However, liner leakage was not expected to occur for a period of approximately two decades due to the low hydraulic conductivity of the proposed liner.

The Board believes that the loss of contaminants from the proposed site would be minimized by the placement of a full clay liner beneath the site and the timely collection and treatment of the leachate. The plume from the existing site would be weakening before leachate would leak through the proposed extension area's liner. Therefore, a portion of the purge well system that would be required to remediate the existing plume would be adaptable for capturing any leachate leakage from the proposed extension area.

The Board has considered the empirical knowledge of groundwater flow and the capabilities of the proposed leachate containment liner, the leachate collection system, the purge well capture system and the leachate treatment facility. If the engineered facilities are properly operated and maintained over the contaminating lifespan of the site, the contaminant loss should be minimal.

The design features for the various components of the engineered facilities would be based on the MOE's requirements and the requirements noted by the Board. These engineered features can be briefly summarized as follows:

- the immediate installation of two purge wells to capture the existing leachate plume near the Washburn Road and direct the contaminated groundwater to the proposed leachate treatment facility;
- the containment of leachate from the proposed extension by a 1.5 metre thick clay liner with a hydraulic conductivity of 10^{-9} m/s;
- the pumping of leachate to a leachate treatment facility from separate sumps for the existing landfill area and proposed extension;
- treatment of the raw leachate and the leachate contaminated groundwater from the purge wells through an RBC system and tertiary treatment facility to remove phosphorus;
- discharge of an effluent that meets the PWQO's and mimics the predevelopment flows.

The engineered leachate treatment facility would be required to produce an effluent that meets the relevant Provincial Water Quality Objectives (or Guidelines) over the contaminating lifespan of the site.

SURFACE WATER IMPACT ASSESSMENT

Surface water run-off drains eastward from the existing site towards the Washburn wetland and the Cataraqui River. The western boundary of the Washburn wetland is approximately 100 metres to the east and an embayment of the Cataraqui River is approximately 300 metres to the east. The Cataraqui River is part of the Rideau Canal system. The Rideau Canal provides a popular recreational waterway and tourism corridor extending from Kingston to Ottawa. Nearby sections of the River are popular locations for fishing, boating, hunting, and swimming.

The Board believes the experience gained from the existing site provides a good benchmark for evaluating the potential impacts for the proposed extension. A 100 year rainfall event occurred in late spring of 1991 during the capping and closure of the existing. Large areas of the landfill were not vegetated and the topsoil was susceptible to erosion.

SCAT produced aerial and ground photographs taken after this major storm event. The photographs revealed extensive siltation and sedimentation in the areas that receive run-off from the landfill. Significant sediment accumulations were visible in the drainage channels leading from the landfill to the Washburn Wetland. A large milky coloured plume was visible exiting the Washburn wetlands and entering the Cataraqui River. This milky plume appeared to originate near the landfill site. The MOE's surface water expert, Mr. Reeves, provided the following relevant comments (Volume 45, p. 25-26):

...we have experienced and demonstrated deleterious effects on water quality regarding a couple of storm events which occurred in 1991.

Based on the experiences of May and June 1991, we found that run-off from the site ... was carrying such significant sediment loads that not only ourselves but the conservation authority and others had concerns about the impacts of those sediments on the wetlands and one would have to question ... how long those wetlands would not only ... provide treatment but how long it would maintain its integrity as a wetland and therefore the species within the wetland...

The proponent's experts attributed some of the siltation to other sources. An intermittent stream north of the landfill site was implicated. This intermittent stream crosses the tilled agricultural fields of the Barmin property; drains into a culvert beneath Johnson sideroad; floods the southwest corner of a property owned by the Heaneys; and then drains through the proponent's buffer lands and into the Washburn wetland.

The Board has carefully reviewed the evidence and the photographs within the context provided by the site visits. The run-off channel from the agricultural fields may be contributing sediment loadings to the Washburn wetland. However, the Board concludes that a significant amount of sediment and siltation from the landfill site entered the Washburn wetland and the Cataraqui River during the storm events in the late spring of 1991. The Board acknowledges that unusually severe storm events occurred during one of the most erosion susceptible stages of landfill operations. However, good planning and appropriate stormwater and sediment control plans should anticipate and prevent such occurrences. The proximity of significant public resources such as the Cataraqui River (Rideau Canal) and the Washburn wetland demands extra vigilance.

In late August and early September of 1991, the proponent's chief consultant collected stormwater samples from ditches in the vicinity of the landfill and ditches that were isolated from the landfill (Exhibit 241). The drainage ditches near the landfill showed total suspended solid levels (TSS) of approximately 400 to 500 mg/l. Much higher total suspended solids (i.e. $TSS > 2000$ mg/l) were found at sites beyond the landfill's influence. These results contrast the relatively rapid erosion of some surrounding agricultural lands with the less rapid erosion of the stabilized, vegetated and closed landfill site. The Board believes these results reveal the benefits of improved runoff and sediment control.

Provincial Water Quality Objectives (PWQO)

The surface water specialist for the MOE provided evidence on the Provincial Water Quality Objectives (PWQO). These objectives are designed to "ensure that the surface waters of the province are of a quality which is satisfactory for aquatic life and recreation" (*Water Management -- Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment* (MOE, 1984)).

The PWQO specify maximum desirable surface water concentrations for certain contaminants that influence aquatic ecosystem health. Each objective is established on the basis of aquatic toxicity testing and scientific rationale. The PWQO are designed to protect public uses of Ontario's surface waters (eg. drinking water, fishing, recreation, and irrigation). There are several surface water quality policies that are relevant to the management of surface waters. Policy 1 is designed to maintain water quality where it is presently better than the objectives. Policy 2 is designed to upgrade or enhance water quality that does not meet the objectives.

The MOE's Kingston Regional Office collected extensive water quality data for the Cataraqui River between 1985 and 1988 during a joint federal and provincial study of the Rideau, Trent, and Severn waterways. Water quality in the Cataraqui River was reported as reasonably good, however, phosphorus levels regularly exceeded the PWQO of .03 mg/l. At the Washburn Lock, located just across the River from the Washburn wetland, phosphorus levels averaged approximately .042 mg/l. The elevated phosphorus levels in the Cataraqui River create a Policy 2 situation. If a Policy 2 condition exists, the MOE requires that all reasonable and practical measures be taken to reduce contaminant loadings. In the case where new or expanded discharges are proposed, further degradation of water quality is not permitted.

An Environment Canada official testified that the Rideau Canal is choked with nuisance weed growth and algal blooms in some shallow areas. Mr. Bruce had visited and observed the Washburn wetland and the adjacent Cataraqui River (Rideau Canal) for many years. He confirmed that the River is shallow and weedy near the wetland. After the major storm events in the spring of 1991, he had observed silt deposits on the aquatic vegetation and the River bottom that he attributed to landfill runoff. He was concerned that this siltation would smother valuable habitat for plants, insects, frogs, fish, waterfowl and other wildlife.

Other local residents were also concerned about the health impacts of the landfill runoff. One mother no longer felt comfortable letting her children swim in the Cataraqui River for fear of bacterial infections. The proponent submitted that agricultural runoff and pleasure boats could be the source of nutrient enrichment and bacterial contamination in the Cataraqui River. Although these are potential contaminant sources, the MOE's surface water representative testified that storm events in the spring of 1991 carried significant loadings of sediment and phosphorus into the Washburn Wetland and the Cataraqui River.

Stormwater Management and Sedimentation Control

The proposed extension would increase the slope of the land surfaces in the southern portion of the landfill site. This could significantly increase surface water runoff towards the Washburn wetland to the east and the Storrington Swamp and discharge stream to the south.

The original stormwater management plan for the proposed extension was similar to the design that led to significant problems at the existing site. Runoff was to be diverted to enlarged roadside ditches; flow through culverts under the Johnson Sideroad and the Washburn Road; and then drain into intermittent stream channels on the buffer lands to the east and south. The adjacent wetlands were to be sinks for the passive treatment of the surface water runoff. According to the MOE's expert:

... we were presented with a design for a series of channels and culverts which essentially took stormwater to the roads bordering the site and across the roads and it did not address what the impacts would be at any of the points beyond the roads. (Volume 45, p26)

The proponent revised the stormwater management proposal significantly during the hearing. The revised proposal would direct stormwater into ditches inside the fenced landfill site. These ditches would then drain three different catchment areas through culverts and/or ditches to three sedimentation ponds. Pond outflows would attempt to mimic predevelopment flows to minimize adverse impacts to the surrounding wetland areas.

The original stormwater plan was prepared and submitted after consultation with government agencies in 1989, three years before the EA hearing. Prior to the EA's submission, the Cataraqui River had been identified as a Policy 2 waterway requiring protection from increased phosphorus loading. However, the EA consultations between the government agencies and the proponent failed to incorporate thorough stormwater management and sedimentation control into the original proposal for the landfill extension.

The existing site encountered serious runoff and sedimentation problems in 1991. According to the MOE's surface water expert, runoff from the existing site contained phosphorus levels (i.e. 0.7 mg/L) that exceeded the PWQO by a factor of 23 (Exhibit 168. p.5). However, the original stormwater control proposals were not revised until over a year later during the EA hearing. The revised stormwater management and sedimentation ponds would require an *OWR Act* approval. The Board was asked to approve conceptual stormwater management plans and leave the *OWR Act* matters to negotiations between the proponent and the government agencies.

Soil Storage

The proponent proposed to store over 100,000 cubic metres of soil on top of the existing landfill site. The stored soil would be surrounded by sedimentation fencing and temporarily vegetated to reduce erosion and sedimentation problems. However, in light of the past runoff and erosion problems at the existing site, this proposal would require very stringent sedimentation controls. The potential effect of the soil's weight on the stability of the existing landfill slopes would also be relevant.

Sedimentation Control

The proponent proposed the following measures for controlling erosion and sedimentation: temporary sediment traps; hay bales; silt fencing; erosion control blankets; sodded swales; timely mulching and vegetation of bare soil; wide, vegetated ditch channels with rip-rap and check dams; sedimentation ponds; and regular maintenance of the aforementioned features.

The proponent proposed two sedimentation ponds on the buffer lands to the east of the Johnson Sideroad and a third pond south of the Washburn Road. The proponent proposed to discharge the ponds via constructed channels to natural drainage paths. SCAT and the former owner of adjacent lands, Mr. Campbell, noted a covenant on the title of the buffer lands to the east. SCAT submitted that the covenant may prohibit the location of the ponds on these lands.

The MOE and the proponent submitted that the covenant did not appear to prohibit the ponds. However, the proponent provided a contingency plan for relocating the sedimentation ponds to address this possibility. The MOE noted that the proposed ponds would be within 120 metres of the provincially significant Washburn wetland. Therefore, an Environmental Impact Study would be required pursuant to Ontario's Provincial Wetland Policy. This issue is dealt with in more detail in the section on ecological impacts.

Surface Water Monitoring

Existing sampling for the Storrington Swamp discharge stream indicates that background water quality currently meets the PWQO. Background water quality information for the Cataraqui River indicates that most of the PWQO are met with the notable exception of phosphorus.

The MOE indicated that surface water monitoring should be at least monthly during the first year of the proposed extension. Surface water sampling would be required for both the stormwater drainage system and any effluent from the leachate treatment plant that would be discharged to the surface water system.

The proponent agreed that the RBC effluent would meet or surpass the PWQO. Therefore, monitoring would need to include the following parameters: ammonia, BOD, phenols, dissolved oxygen, phosphorus, TSS, aluminum, cadmium, copper, cyanide, chromium, mercury and lead. In addition, the effluent from the proposed sedimentation ponds would need to be regularly sampled for TSS, phosphorus, ammonia and BOD. The Board believes that frequent surface water monitoring would be necessary during the opening and closing years of Landfill operations.

BOARD CONCLUSIONS ON SURFACE WATER IMPACT

Given the proximity of the provincially significant Washburn Wetland and the sensitive Rideau Canal, the development of better plans for surface water protection should have occurred long before the hearing. The Board believes the proponent, in conjunction with relevant government agencies, has not demonstrated an ability to anticipate and avoid off-site surface water impacts. Therefore, the responsibility for the design of stormwater control measures will not be fully delegated to "negotiations" between the proponent and the relevant government agencies.

The proposed extension could significantly increase the surface water flows towards the Storrington swamp and the headwaters of the discharge stream. In addition, there are other potential sources of increased surface water flows. The proposed Leachate Treatment Plant would discharge up to 28,000,000 litres/year from the proposed extension and the purge well contingency could add 342,000,000 litres/year to the potential discharge of the Leachate Treatment Plant. Therefore, a study would be needed to determine how the predevelopment flows would be maintained to the Washburn wetland, the Storrington swamp and the discharge stream. Infiltration trenches or some other groundwater recharge method may be necessary to direct a portion of the effluent from the RBC and the surface water system back into the groundwater flow system.

The evidence confirms that erosion and sediment loading could aggravate existing weed, algae and water quality problems in the Cataraqui River (Rideau Canal). The Board believes the aggravation of existing water quality problems would be contrary to the PWQO, the *EA Act*, the *OWR Act*, and the *Federal Fisheries Act*. Excessive sedimentation or siltation could also alter the ecological functioning and biodiversity of the Washburn wetland. This alteration would be contrary to the purpose of the *EA Act* and the recently announced Provincial Policy on Wetlands.

The Board has considered: the demonstrated environmental impacts of inadequate stormwater and sedimentation control at the existing site; the proximity of the provincially significant Washburn Wetland; the proximity of the Rideau Canal - a Policy 2 waterway; and the proximity of the Storrington Swamp and discharge stream. Stringent surface water management and sedimentation control standards would therefore be required.

The storm that caused the significant sedimentation and siltation problems was a hundred-year event. Given the unpredictability of storm events and climatic conditions, the stormwater ditches, ponds and culverts for the proposed extension would have to be designed to accommodate the 100 year storm event. An additional contingency capacity of 20% would also be necessary to accommodate some capacity displacement due to ongoing sedimentation.

One of the proponent's expert witnesses, Dr. D. Smith, testified that cattails and natural vegetation communities can enhance water quality and quantity control. He testified that cattails could be established in stormwater ditches and ponds without great expense. The evidence also indicated that other vegetation can stabilize soils, reduce erosion, improve sediment removal, remove water impurities, enhance wildlife habitat and absorb phosphorus.

The Board concludes that surface water control structures that imitate natural ecological functioning would have the best opportunity to control off-site impacts and compensate for site disturbance. Therefore, guidelines for the development of an ecologically sound surface water management system would be stipulated by the Board pursuant to *EA Act* ss. 14(b)(ii).

ECOLOGICAL IMPACT ASSESSMENT

A survey of the landfill vicinity formed the basis for the EA's consideration of potential natural environment impacts. The survey by Mosquin BioInformation Limited was based on a single site visit of a few hours length in May of 1986. The resulting report included the following comments:

[The groundwater discharge area south of Washburn Road] includes a combination of swamp and wooded fen habitat with species that are characteristic of these sorts of habitats ...

The true value of this wetland in relation to others in the general area would require the application of the [Guidelines for Wetlands Management in Ontario (1984)], a process that would take some weeks of field work depending upon the number and size of wetlands to be compared.

But generally speaking, the extension of the landfill area southward up to the vicinity of the road would have little direct impact upon the flora and fauna of this particular wetland, although we cannot speak for the possibility of groundwater contamination and its impact on plants and habitat in the future ...

Immediately to the east of the existing landfill and across the road is found a clearly valuable local marsh-meadow-forest complex [Washburn Wetland]. Beaver activity in the area is obvious. Here, we find a series of water filled depressions such as often are favoured habitat for waterfowl, turtles, frogs, muskrat and a wide range of wetland wildlife that require or prefer marsh habitat for living. This appears to be the most valuable habitat area in the general vicinity of the landfill ...

As numerous species of interesting and valuable wildlife depend on this sort of habitat, any serious contamination of the surface water could be a matter of concern in the future.

To summarize, the proposed extension of the landfill southward should have relatively insignificant impact on the vegetation, wildlife and general ecology of the area proposed for extension as well as upon areas immediately around the landfill site. This assumes that surface water upon which local wildlife populations are dependent was not seriously contaminated.

SCAT's wetland specialist also surveyed the vicinity of the Storrington site. Although this survey was also based on a single day visit on June 4, 1991, it included the following observations on the Washburn wetland and the Storrington swamp:

The Washburn wetland is a small 62 hectare wetland located approximately 100 metres east of the landfill along the Johnson Sideroad. Most of the wetland (75%) is marsh associated with the Cataraqui River, the Class 2 ranking of the wetland is due to its high biological productivity and diversity, the regional importance of the marshes for waterfowl staging and the presence of two regionally significant species. ...

Storrington swamp is located on the south side of Washburn Road, directly adjacent to the proposed landfill extension. This small 5 ha wetland was evaluated as being class 7, the lowest possible wetland class. The evaluation indicates that the wetland is 100% swamp ...

The mature cedar swamp that dominates the wetland is very rich with a well developed moss and herb layer ... The swamp is slightly domed, that is it is higher in the centre than the edges. This doming is partially caused by the hydrostatic pressure from the groundwater upwelling beneath the swamp. The moss floor of the swamp actually "quakes" slightly when walked upon. The moss layer is extremely well developed and is permanently soaked with groundwater.

The stream running along the eastern side of the wetland stems from a spring located near the [Washburn] road at the northeastern edge of the wetland. Several other small upwellings are located along the length of the stream. Marl consisting of calcium carbonate, silt, shell fragments of freshwater molluscs and tiny fragments of calcified aquatic plants is abundant throughout the creek... This marl indicates the presence of calcareous groundwater upwelling beneath the swamp over a long period of time. ...

The flora and fauna found in this wetland are common and typical of swamps throughout the region ... and no rare or significant species were observed... Nevertheless, the domed and quaking nature of the cedar swamp and the marl deposit beneath this wetland may be considered to be unusual features in southern Ontario.

Although the current evaluation and mapping of the Storrington wetland on file at the MNR is poorly done (i.e. the wetland is larger and marsh habitat is present), the wetland would in all probability "score" no higher than Class 5 if it were to be re-evaluated correctly.

SCAT's wetland biologist identified several deficiencies in the ecological evaluations and the proponent's consideration of potential natural environment impacts. These deficiencies can be summarized as follows:

- the work done by Mosquin BioInformation represents a reconnaissance survey that does not contain the detail required for an Environmental Assessment;
- since some species are most readily observed in different seasons, a proper wetland survey should be based on at least one site visit during the each of the three seasons of spring, summer and fall;
- the inventory of wetland features, functions and species was not sufficient to identify the potential for significant ecological impacts;
- potential ecological impacts from noise, dust, siltation, and contaminant bioaccumulation and bioconcentration were not evaluated;
- a fisheries survey was not undertaken and therefore the potential impacts on fish habitat were neglected;
- the impacts of run-off water quality from the existing and proposed site and possible changes in the post-extension water flows were not thoroughly evaluated.

The Board agrees with the analyses of SCAT's wetland expert. The Mosquin BioInformation report provided a scant inventory of the wildlife utilizing the two wetlands and a superficial treatment of the potential ecological connections between the landfill area and the wetlands. In the absence of a more detailed inventory of fish and wildlife and ecological functions, the Board finds the summary of this early study was premature.

The Mosquin BioInformation survey did identify the following important issues: the valuable nature of the Washburn wetland; the requirement for further field studies if the two nearby wetlands were to be classified according to the provincial system; and the potential impact of groundwater and surface water contamination on the wetlands. However, these matters were not further investigated before the EA planning process had been completed and the EA document was submitted. The proponent noted that the responsible government agencies (eg. Cataraqui Conservation Authority, MNR) expressed general satisfaction with the level of detail of the proponent's EA.

The Board notes that the Mosquin BioInformation survey was conducted prior to the proposed extension's designation under the *EA Act*. The purpose and provisions of the *EA Act* require a thorough examination of the potential ecological impacts (costs) of an undertaking. In this case two wetlands were identified in 1986 within close proximity to the proposed extension. Therefore, the Board believes that the proponent and/or the responsible agencies should have conducted a more detailed environmental impact study before the EA was completed. The Mosquin BioInformation survey noted the value of the Washburn wetland and the Guidelines for Wetlands Management in Ontario (1984). These 1984 Guidelines were available during the preparation of the EA. The Guidelines include the following statements:

Wetlands are important to Ontario's economy. They maintain water quality, help control flooding, provide habitat for fish and wildlife, and contribute substantial social and economic benefits. These include outdoor recreation and tourism benefits from such activities as hunting, fishing and bird watching amounting to over 53 million user-days per year for over 7 million residents. Wetlands also contribute to the ecological diversity of the landscape and provide habitat for several threatened and endangered species.

Every land-use planning and resource-management agency should have regard for the implications of its actions on wetlands within its management area.

The wetlands adjacent to the proposed landfill extension were not evaluated or classified until almost a year after the EA process was completed and the EA was submitted. In late spring of 1990, an MNR commissioned survey was conducted. The field survey, which took less than one day to complete, resulted in a provincially significant Class 2 rating for the Washburn Wetland and a class 7 rating for the Storrington swamp.

Provincial Wetland Policy

After a decade of consideration, a Provincial Wetland Policy was announced in the spring of 1992. The Policy Statement indicates that over three quarters of the original wetlands in southern Ontario have already been lost to development. The Policy notes that Wetlands:

are important for the control and storage of water and the recharge and discharge of groundwater; maintain and improve water quality, aid in flood control, and protect shorelines from erosion; trap sediments which would otherwise fill

watercourses; support and initiate complex food chains which are ultimately essential to a broad spectrum of living organisms, including humans; provide habitat for a wide variety of plant and animal species; immobilize some contaminants and nutrients and reduce other contaminants to less damaging compounds; assist in maintaining water quality in adjacent lakes and streams that support fish populations; provide valuable resource products such as timber, fish and wild rice on a sustainable basis; contribute substantial economic and social benefits to the Province; and, provide active and passive recreational opportunities in green space settings.

The MNR did not appear at the hearing to represent its Wetland protection mandate nor to provide the Board with information on the implementation of the new Policy. A copy of the Ontario Wetland Policy was filed by the MOE. Two of the stated objectives of this policy are: to ensure no loss of Wetland Function or Wetland Area of Provincially Significant Wetlands in the Great Lakes-St. Lawrence Region; and to encourage the conservation of other wetlands (eg. classes 4 - 7) throughout Ontario. An Environmental Impact Study is required for developments in the vicinity of provincially significant (Class 1, 2 and 3) wetlands.

The provincial Wetland Policy does not permit development within provincially significant wetlands (i.e. Class 1, 2 and 3) such as the Washburn Wetland. Development within 120 metres may be permitted, if an Environmental Impact Study demonstrates that the development will not result in any of the following: loss of wetland function; subsequent demand for future development which will negatively impact on existing Wetland functions; conflict with existing site specific wetland management practices; and, loss of contiguous wetland.

The Board acknowledges that the proponent proposed significant mitigation measures during the hearing (eg. sedimentation ponds, leachate treatment facilities) for preventing off-site impacts to the natural environment. The Board also acknowledges that the expectations of the relevant government agencies during the preparation of the EA documents appear to have been generally satisfied. However, the proponent's failure to conduct an adequate ecological impact study makes it difficult to judge the sufficiency of the proposed mitigation measures. This failure is difficult to reconcile with the purpose of the *EA Act*, Ontario's Wetland Policy, and the Guidelines that preceded Ontario's Wetland Policy.

Furthermore, Storrington Township Official Plan Amendment No. 17 (1988) relates to the use of the Storrington swamp for leachate treatment. This amendment states that consideration shall be given to the sensitivity of the existing wetland as a habitat for wildlife species and the treatment systems shall meet the water quality standards prescribed by the MOE.

BOARD CONCLUSIONS ON ECOLOGICAL IMPACT ASSESSMENT

The evidence of SCAT, Environment Canada, the MOE and Mr. Bruce provided the best analyses of the potential environmental impacts of the proposed undertaking. For example, the field observations of Mr. Bruce indicated that migratory waterfowl were returning to the Washburn Bay in greater numbers since the existing landfill had closed. In the absence of significant natural environment evidence from the proponent, the Board accepts the general evidence of the other parties.

The boundary of the Washburn Wetland noted in the MNR survey and the mapping by SCAT's wetland biologist is approximately 120 metres from the eastern boundary of the proposed extension. In addition, the proposed stormwater management plan could involve sedimentation ponds within 120 metres of the Washburn wetland boundary. The MOE concluded that an Environmental Impact Study would be required pursuant to the Provincial Wetland Policy. The Board agrees with this MOE conclusion. In the absence of evidence to the contrary, the Board would require the following research, studies and reports:

- the fish, wildlife, plants, birds and wetland functions of the Washburn and Storrington wetlands would need to be surveyed in May of 1993, prior to the commencement of major landfill construction operations;
- based on the aforementioned survey and other available information, an Environmental Impact Study would need to be prepared to determine the potential ecological impacts of the proposed extension;
- the Environmental Impact Study would need to include a groundwater and surface water budget for determining how runoff and effluent from the leachate treatment facility can be managed to maintain predevelopment flows to the Washburn wetland, the Storrington swamp and the discharge stream;

- the results of the Environmental Impact Study would be used by the MOE and the MNR to determine any additional mitigation measures or design features that would be necessary to prevent the loss of wetland function in the Washburn Wetland;
- additional surveys of fish, wildlife, plants and birds would need to be undertaken in the summer and fall of 1993 and thereafter on a yearly basis in late spring until three years after the landfill closes;
- algae populations and sedimentation would need to be sampled quantitatively at approximately the 450 metre downstream section of the discharge spring and the outlet of the East Pond into the Washburn wetland. Sampling would occur during June and August of 1993 and each June and August thereafter until the end of the landfill's contaminating lifespan;
- at least two sensitive vertebrate species (eg. a fish and a bird) would have to be surveyed on a regular yearly basis from 1993 until at least the year 2003 to evaluate population levels in the Washburn Wetland and the Storrington Swamp and stream;
- beginning in May of 1993, and each spring thereafter for at least ten years, studies would need to be conducted to examine potential bioaccumulation and biocentration of contaminants at the 450 metre point in the discharge stream and in the Washburn Wetland near the outlet of the East Pond. For example, freshwater clams and leeches could be placed in under-water cages and after exposure to the local water conditions for several weeks these organisms could be analyzed for potential bioaccumulation of landfill contaminants;
- The results of the aforementioned surveys and sampling would be contained in the annual report for the landfill and would be submitted to the MOE, the MNR, the Cataraqui Conservation Authority, the Public Liaison Committee; and the Storrington Township Library.

AIR QUALITY IMPACT ASSESSMENT

The public witnesses and the MOE records revealed numerous odour complaints. The majority of the complaints occurred within one kilometre of the landfill site after the existing landfill was closed and capped. Some nearby residents testified that the odour was occasionally strong enough to wake them up at night. During the Board's site visits a strong odour was occasionally apparent. According to the proponent's experts, the sulphurous gases that cause odours can be detected by some people at concentrations as low as a few parts per trillion.

The public was very critical the MOE's response to complaints. For example, if a complaint was registered it often required more than a few hours for the arrival of a Ministry abatement officer. By then, the odour problem had often dissipated. The residents felt that the reduction in odour intensity during the delay contributed to the discounting or trivializing of their complaints by some MOE abatement officials.

Effectiveness of Charcoal Canister Filters

The existing landfill has several manholes that are connected to the leachate collection system. The proponent's consultants suspected that malodorous sulphurous gases were escaping through the manhole vents and creating the odour problems. The proponent had applied to the MOE to install charcoal canisters at the several manholes to filter out the malodorous gases. Two canisters were approved on a trial basis after a few months delay, however, the remaining canisters were not approved until during the hearing.

The MOE expert, Mr. Grant, evaluated the proponent's data on the gases entering and leaving the trial charcoal canisters and concluded (Exhibit, 2.7):

... outlet sulphur compound concentrations for both the entrance manhole canister and the "old" centre manhole canister were either the same or higher than the inlet concentrations. The outlet concentrations of "other sulphur compounds" for the "new" centre manhole canister were higher than the inlet concentration. This suggests that the canisters were not effective at controlling sulphur compounds in the landfill gas.

Collection efficiencies of the NMOCs for the entrance canister and the "old" centre canister ranged from below zero to 50%. The "new" centre canister appeared to be more effective at controlling NMOCs but the age of the Entrance canister and "old" Centre canister become relevant in assessing the overall effectiveness of the charcoal canisters.

The proponent submitted that the regular maintenance of canisters in all the manholes would overcome the performance problems identified by the MOE. The proponent maintained that the charcoal canisters were the most reasonable and cost-effective approach to odour and gas control. The MOE and the proponent suggested various monitoring procedures and triggering procedures that could be used to implement contingency measures (eg. active gas collection) if the canisters failed to solve the odour problems.

The Board requested information on the proportion of gases that would diffuse through the landfill surface as opposed to escaping through the manhole vents. The proponent's consultants predicted that gas flux from the manholes would be several orders of magnitude greater than flux through the landfill soil cover. However, the proponent's consultants had ignored the following factors: the actual venting area of the manholes is several orders of magnitude smaller than the area of the landfill; the soil covering the landfill is likely to increase in permeability over time due to the action of freeze and thaw cycles, surface erosion, vegetation rooting, and soil organisms; and, the actual installation and sealing of the charcoal canisters could create a back pressure that would reduce the escape of gas through the manholes.

The intervenors were primarily concerned with noxious odours emanating from the site. However, one of the public witnesses, Mrs. Wittman, commented: "the gases emitted from the dump site are also a pollutant that nobody wants to be breathing" (Volume 27, p81). The Board asked the proponent and the MOE to provide a broader analysis of the potential gaseous emissions from the site. An excellent MOE response was received through the evidence and witness statement of two representatives from the MOE's Air Resources Branch.

Gaseous Emissions and MOE Air Quality Guidelines

On behalf of the proponent, Concord Environmental Consultants submitted an "Air Quality Assessment of Landfill Gas Emissions from Laidlaw Storrington Landfill site" (Exhibit 217). The United States Environmental Protection Agency (U.S. EPA) kinetic model was used to predict landfill gas generation, vinyl chloride emissions and concentration of vinyl chloride near the property boundaries. The report concluded that the impacts on surrounding air quality would not violate Ministry Guidelines.

The MOE comments revealed some significant problems with the proponent's gas study. The MOE expert, Mr. Grant, questioned the use of an average or median value from the U.S. EPA data since the MOE requires an estimate of maximum concentrations. The Air Resources Branch's *"Interim Guide to Estimate and Assess Landfill Air Impacts"* suggests the use of the 95th percentile value of vinyl chloride concentration. The MOE report states that:

In summary, the [proponent's] submission does not assure us that the landfill gas emissions from the Storrington site result in minimal air impacts that comply with Ministry Point of Impingement Limits.

Landfill Gas Generation

According to the MOE experts, landfill gas generation occurs after several years of landfilling due to the action of anaerobic (without oxygen) bacteria. Gas production can last from 17 to 57 years. Organic acids (eg. acetic acid) that are produced during the initial stages of organic waste decay are eventually digested by methanogenic bacteria. These bacteria produce carbon dioxide and methane. Landfill gases can also be created through evaporation and chemical reaction.

Landfill gas can migrate through soil and can pose an explosive hazard in enclosed spaces when found in concentrations between 5 and 15% by volume. The proponent had established a number of gas monitors around the site to monitor methane levels.

Toxic Emissions

Landfill gases typically contain up to 1.5% by volume of non-methane organic compounds (NMOCs) after steady state methane production is reached. The U.S. EPA examined 46 landfill sites and identified 95 compounds within the NMOC fraction. They estimate that this represents approximately 5% of the total NMOCs. Some of the compounds most commonly found in the U.S. EPA study include: trichlorofloromethane, benzene, toluene, vinyl chloride, perchlorethene, methylene chloride, dichloroethene, carbon tetrachloride, ethene dichloride, and chloroform.

Ambient air sampling has also been done around a few Ontario landfills. Although impacts on ambient air quality were detectable, the initial sampling results did not detect concentrations that would violate the MOE's point of impingement limits. More comprehensive data from studies done in California suggest that exceedances at some sites are possible. Air impact studies conducted at over 300 landfills in California indicate that approximately 8% of these landfills would exceed the MOE's point of impingement limits for toxic compounds such as vinyl chloride, ethylene dibromide and methylene chloride.

Global Warming

The witness statement of the MOE's Air Resources Branch representatives noted that carbon dioxide and methane contribute to global warming. Apparently, the atmospheric level of methane is increasing at a faster rate than carbon dioxide and the global warming potential of methane is estimated to be much greater. Landfill gas can contain up to 50% methane.

According to the MOE, swamps and livestock are the most significant contributors to atmospheric methane but landfills are one of the largest sources of methane emissions from human activities. A Discussion Paper on Global Warming (MOE, September 14, 1992) estimated that methane emissions comprise 8% of Ontario's global warming contribution. More than half of the emissions from human activities in Ontario are contributed by landfills. The Ontario Roundtable on Environment and Economy has recommended that the Government of Ontario begin developing regulations to require owners of large landfills to install methane gas-collection and flaring systems (*"Restructuring for Sustainability"*, September 1992).

Landfill Gas Mitigation

A significant number of odour complaints from local residents eventually resulted in the installation of a landfill gas collection and control system at the Brock West landfill in Pickering. Mr. Grant testified that a passive gas collection and flaring system was not completely successful in eliminating odour complaints near the Brock Landfill. However, the installation of an active gas collection and controlled combustion system was successful. The witness statement for the MOE's landfill gas expert contained the following (Exhibit 217):

Gas collection and control systems have been installed at a few larger landfills in Ontario such as the Brock West landfill in Pickering, the Keele Valley landfill in Vaughan and the Trail Rd. landfill in Ottawa but many other larger sites are presently emitting landfill gases uncontrolled.

The environmental impact of landfill gas emissions can be mitigated through the installation of an active gas collection and control system where wells are drilled; piping is installed vertically and/or horizontally throughout the landfill; and a fan draws the gases back to a flare or energy recovery facility where the gases are incinerated ...

Technical details and cost estimates of these systems depend upon site specific factors such as the size and depth of the landfill, age of the refuse and moisture content. However, based upon a US EPA gas collection cost estimating procedure, costs for the gas collection and control systems are anticipated to range between \$1 and \$2 per tonne of in-place waste for larger landfills.

Landfill Gas Monitoring

The proponent had already established several gas probes around the existing landfill. SCAT's consultant suggested that landfill gas would be most likely to migrate towards the west and the north during wet and frozen conditions. He recommended that monitoring should consist of gas probes located around the perimeter of the site and near landfill related buildings. The gas monitoring programme would measure; combustible gas content, gauge pressure, temperature and water level. The suggested frequency of sampling was once each second month for a total of six times each year.

The Board believes that the requirement for the active gas collection system should reduce the potential for gas migration. However, the Board recognizes that gas monitoring would be necessary to monitor and regulate the active collection of the landfill gas.

BOARD CONCLUSIONS ON AIR QUALITY IMPACT

Although there is no evidence that the gaseous emissions are currently violating Ministry health and safety guidelines, there is insufficient evidence to determine the contrary. SCAT's toxicologist noted that a number of landfill gases can pose health and safety concerns. The cumulative impacts of landfill gas emissions on ambient air quality and global warming must also be considered.

The Board is particularly concerned for families living within a few hundred metres of the existing site. Variability in meteorological conditions, landfill gas production and landscape could result in transitory but recurrent pockets of gas that would be difficult to predict and expensive to monitor. The occupational health and safety of the landfill site's employees would also be relevant. These employees would spend long time periods next to the existing site.

Mr. Grant testified that the technology exists to actively collect and combust the landfill gases (i.e. methane, NMOC). A controlled combustion process would burn the methane and virtually eliminate the noxious gases. This process also offers the option of harnessing the combustion energy to generate heat or electrical power, thereby providing a double environmental benefit. The installation of an active gas collection and combustion system was the solution ultimately required to address the odour problems at Brock West Landfill.

The Board is convinced that the proposed contingency of active gas collection and combustion should be implemented immediately for the old site. The proposed extension would have to be designed to allow active gas collection and combustion as each cell of the expansion area is capped and closed. Any collection and combustion facilities would have to be carefully located and landscaped to prevent adverse visual impacts, particularly from the Rideau Canal and the surrounding residents.

SOCIAL IMPACT ASSESSMENT

The *EA Act's* definition of the environment includes the social, economic and cultural conditions that influence individual and community life. Therefore, the assessment of potential social impacts and the development of measures for preventing and/or reducing those impacts is an important requirement of the *EA Act*.

A Social Impact Assessment (SIA) was prepared and submitted in 1990 approximately a year after the EA was submitted. The proponent's SIA surveyed the local community to: describe its general character; identify public perceptions, issues and concerns regarding the Landfill proposal; assess the potential impacts of the proposal; and recommend measures to reduce negative community impacts.

The proponent's SIA acknowledged the probability of standard impacts such as:

- some residents within 1 km of the proposed extension may be negatively affected by noise, litter, birds and rodents, visual impacts, and dust, to an extent which may interfere with their day to day activities and use and enjoyment of property;
- residents living along the access routes to the proposed extension may be negatively affected by noise, litter and traffic;
- residents living near the proposed landfill extension or along access routes may experience a reduction in property value as a result of impacts from the proposed extension; and
- the Brewers lock facility may be negatively affected if users are disrupted by traffic and seagulls associated with the proposed extension.

Another group of potential social impacts were identified as "special impacts". Special impacts are the behavioral responses and actions that result from public perceptions of a proposed facility. Potential special impacts include: the development of negative attitudes or opinions about the community; the movement of people away from the community; and psychological impacts such as anxiety and stress.

The Social Impact Assessment specialist for the MOE was Mr. McAllister. He concluded that the proponent's SIA was adequate, given the MOE's expectations at the time the proponent's SIA was submitted. However, the expectations for SIA are increasing and he noted a number of weaknesses in the SIA. One of the weaknesses was the failure to document how community concerns were addressed within the EA planning process. Another weakness was the failure to identify how the needs and sensitivities of the local community were factored into the proposed mitigation measures.

The MOE specialist also suggested that potential impacts could have been illustrated through the mapping of plumes of impacts. This method readily identifies cumulative impacts by the overlap between potential plumes of impact. The survey of public experiences with the past site operations would have made this plume mapping relatively easy in the current case.

The proponent introduced a proposal for property-value protection and property-specific mitigation at the hearing. Mr. McAllister acknowledged the potential benefits of this proposal. However, he agreed with SCAT that the development of the proposal should have involved public consultation. In addition, he noted that compensation for impacts should only occur after thorough impact prevention at source.

According to Mr. McAllister, a good SIA should be conducted from the beginning of the EA process. The SIA can help with the design of an accountable decision-making process that meets the needs of the community and the environment. He noted that human perception of risk is influenced by the sense of control over that risk. If the public senses that the decision-making process is accountable to their concerns, their sense of risk is reduced. Therefore, a good SIA should make the EA process shorter, less contentious and less likely to require a hearing.

The Board believes that the evidence of Mr. McAllister has merit. Social Impact Assessment can make an increasingly important contribution to the EA process. SIA can help to identify and incorporate community and public interests within the EA process. An early knowledge of the "social context" is important to assist in the timely identification of interested groups and individuals, the design of a fair and accountable presubmission consultation process, the identification and application of evaluation criteria, and the eventual selection and design of a preferred alternative that has the highest possible level of public acceptance.

The proponent's SIA provided an adequate summary of potential impacts and mitigation measures. However, its usefulness was limited because it was conducted after the EA planning process was completed and it did not involve meaningful public consultation.

The Board believes that public participation during the hearing provided the most valuable insights into the potential social impacts. The local community provided abundant first-hand evidence of the social impacts during the previous operation of the Storrington Landfill. Therefore, the potential social impacts and the proposed mitigation measures will be addressed in the context of the public input on the various social impact issues.

Types of Waste

Some residents expressed concerns about the lax security at the site during the early years of its operation. They wanted assurances that hazardous waste would be excluded from the site.

The proponent noted that the site would only receive non-hazardous solid waste. The site is now completely fenced and the gates would be locked after hours. The proponent also indicated that all waste would go through the transfer station in Kingston before being deposited at the landfill. This would provide an opportunity to scrutinize the waste at the transfer station and when the waste is unloaded and spread at the landfill. The proponent submitted that:

Any suspicious containers will be checked to make sure that they do not contain unacceptable waste material. If unacceptable wastes are found, the containers will not be accepted for landfilling and will be returned to the waste generator. Individuals found trying to dispose of unacceptable wastes will lose the privilege of using the landfill.

The proponent also proposes to continue receiving Certified non-infectious animal carcasses from veterinary clinics and the Humane Society. Some members of the public expressed concerns regarding the potential health implications of this proposal. They were sceptical of the certification process and they were dissatisfied with the security of the vehicles used to transport the dead animals to the landfill site.

Traffic

The proposed access route to the landfill is; highway 401 to highway 15, north on highway 15 to County Road 12, west on County Road 12 to the Johnson Sideroad, and south on the Johnson Sideroad to the Landfill entrance. Although there are no homes along the gravel Johnson Sideroad, several homes exist along the paved County Road 12 portion of the route.

Before the landfill closed, refuse vehicles made up approximately 2% of the daily traffic on Highway 15, 15% of the daily traffic on County Road 12, 56% of the daily traffic on the Johnson Sideroad, and 7% of the daily traffic on the Washburn Road. Approximately sixty vehicles per day used the site in the past. Medium-sized commercial trucks and small private vehicles accounted for 83% of the traffic and transport trailers accounted for the remainder.

The public witnesses testified regarding the safety, noise and dust problems created by the landfill traffic in the past. Several local residents asserted that the refuse vehicles endangered local traffic and pedestrians by speeding and poor driving habits. Other hazards to vehicles and pedestrians were encountered due to gravel and debris originating from the trucks. The Heaneys use the Johnson Sideroad to gain access to their farm fields. According to Mrs. Heaney, more than one refuse vehicle failed to stop before exiting the landfill and nearly collided with her farm vehicle. Some refuse vehicle operators failed to demonstrate common driving courtesy to other vehicles using the Johnson Sideroad.

Some residents living along County Road 12 expressed concerns regarding the noise, dust and vibrations from large refuse trucks travelling at excessive speeds. The proponent's planning witness discounted the importance of traffic impacts along County Road 12. Since the road was originally approved and designed for a much higher eventual capacity, he felt the complaints about increased traffic levels were unjustified.

The proponent's area supervisor, Mr. Walters, noted that a weigh scale was proposed for the site extension. This would require the drivers to stop before entering or leaving the site. The proponent also pledged money to Storrington Township for the paving and widening of Johnson Sideroad. Mr. Walters assured the public that Laidlaw would take actions to improve the driving habits and courtesy of their drivers. He indicated that Laidlaw was prepared to take disciplinary action if public complaints identified a future problem.

Approximately sixty trucks per day would be required to deliver aggregate to the Site for a period of two to three weeks during the construction of the landfill extension. The proposed source of the aggregate would be the Silver Pit or the Barmin property adjacent to the site. The access route from the Silver Pit would be County Road 11, County Road 12 and Johnson Sideroad. Three to fourteen trucks per day would also be required on an ongoing basis to deliver cover material and aggregate. After the initial construction of the landfill extension, the proponent proposed to limit the number of cover material and aggregate trucks to 14 vehicles per day (Exhibit 85).

The proponent submitted that fewer daily refuse truck trips would be necessary for the proposed extension. All waste would originally go to the Laidlaw Transfer Station in Kingston where it would be compacted into large trailers for transport to the Storrington site. Therefore, fewer trucks would arrive at the site each day. Storrington Township agreed to co-operate with the diversion of local refuse vehicles to the Kingston Transfer station to reduce local traffic and nuisance impacts (Exhibit 172, p. 1).

Dust

In the past, many smaller refuse vehicles had accessed the site via the Washburn Road and Johnson Sideroad. These small rural roads have a gravel surface and the local residents complained that landfill traffic created dust problems during dry summer periods.

If the landfill site is approved, the proponent has agreed to pay the Township of Storrington up to \$200,000 for the paving and upgrading of the Johnson Sideroad from the intersection of County Road No. 12 to the entrance of the landfill site (Exhibit 129, Host Municipality Agreement, p. 30). Additionally, the proponent proposes to use calcium chloride solution and/or water to minimize dust generation from the proposed extension. The proponent submitted that access to the proposed extension would be confined to Laidlaw vehicles originating from the transfer station. These vehicles would use the paved Johnson Sideroad, thereby eliminating most of the dust impacts associated with landfill traffic in the past.

Litter and Illegal Roadside Dumping

Local residents raised numerous concerns about the impacts of the landfill on litter and roadside dumping. In the past, public right-of-ways and private property were sometimes littered by refuse from vehicles with inadequately covered and secured contents. According to the residents, Storrington Township and the landfill operator failed to remove the accumulated litter and debris in a timely manner. A local farmer testified that past littering and roadside dumping had disrupted farming activities and damaged farm equipment.

A very high wind event occurred just prior to Easter in 1990. Although the wind velocity reportedly exceeded 100 kilometres/hour, waste deposition continued. A video and photographs were introduced to illustrate the significant off-site litter impacts that resulted. According to SCAT, this event dramatically demonstrated the proponent's failure to prevent litter from leaving the landfill property.

The proponent's counsel acknowledged past problems with respect to the littering of neighbouring properties. The following mitigation measures were put forward for the proposed extension: improved use of cover materials and litter fences around the active landfill area; a policy to cease landfilling during wind speeds that result in off-site litter movement; and a daily litter pick-up program on the site property. The proponent and the Township of Storrington also agreed to the following roadside clean-up programme (Exhibit 129, p. 35):

Laidlaw agrees to clean up at its expense on a daily basis any litter caused by Laidlaw along the Designated Access Road or on Washburn Road immediately south of the Extension Area. Laidlaw further agrees to clean up any litter caused by Laidlaw on private property where the property owner consents to Laidlaw entering the property for the purpose of cleaning up such litter, whether or not a complaint has been lodged with Laidlaw or the Township.

The proponent's counsel noted that the extension proposes to receive waste from Laidlaw vehicles originating from only the transfer station. Since these vehicles are properly covered and secured, the opportunity for debris to fall onto the roadside and adjacent private property would be significantly reduced.

Noise

According to the public witnesses, three types of noise from the past site operations were most annoying: the high pitched safety back-up beepers on the trucks and equipment; tailgates slamming on the trucks; and refuse vehicle traffic on County Road 12, Johnson Sideroad and Washburn Road. Many people reported hearing the high pitched beepers up to a kilometre away. Some nearby residents were employed in shiftwork and the landfill noises disturbed their ability to rest during the day.

The proponent suggested several mitigation measures that were not previously deployed. A several metre high earthen berm was proposed for the southern and eastern perimeter of the site; small temporary berms were proposed around the active landfill area; and the equipment using the site would comply with modern noise abatement standards (eg. muffling devices).

Although the back-up beepers are a vital safety device, they create significant off-site nuisance impacts. The possibility of equipping site workers and equipment with a proximity warning device was discussed by the parties. The device would warn the equipment operator if they were getting too close to a site worker. Presumably, this would reduce the need for the regular use of the back-up beepers. If this innovation is perfected, it could reduce the noise impacts from a wide range of heavy equipment uses.

Tail gate banging was primarily associated with the intentional jarring of the dump-box on trucks to dislodge their full contents. The Board believes that the creativity applied to back-up beepers could also result in a solution to this noise problem. A locking hinge or damper could prevent the truck tail-gates from noisily slamming shut during the dumping operation.

The MOE noise guidelines set a maximum desirable average noise level of 55 dB for outdoor residential amenity areas. According to the proponent's noise expert, the planned mitigation measures would reduce average noise levels to within the MOE's guidelines. However, the Board has some concerns about the residual impacts since the MOE guidelines appear to be based on average values. A large noise that occurs only once or twice an hour (eg. a tail gate slamming shut) may be sufficient to cause an adverse affect on someone who works shifts and must rest during the day. This factor should be considered in an evaluation of noise mitigation.

Noise may also have an affect on the recreational enjoyment of residential amenity areas (eg. back yards) and public areas surrounding the site and along the haul routes (eg. County Road 12). Although these impacts are less tangible they are important. The proponent's noise expert testified that the most desirable action is to address the noise problem near its source. He indicated that a thirty metre vegetated and mulched buffer strip could provide good natural noise attenuation.

If the residual noise generated is still a problem after the on-site mitigation measures, the proponent has proposed a compensation policy as a contingency. The proposed compensation package provides for noise mitigation by funding the insulation (eg. triple glazed windows) and/or air conditioning of impacted homes.

Visual

The existing site and the proposed extension area are not significantly set-back from the Johnson Sideroad and the Washburn Road. Although there are no homes along the Johnson Sideroad, approximately a dozen homes are located within 1 kilometre of the site along the Washburn Road. The site can be seen from many of these homes, particularly when the deciduous trees are without leaves.

The existing site and the proposed extension, are also visible to the recreational users of the Washburn Locks and the Rideau Canal. Counsel for Environment Canada attended the initial and latter stages of the hearing to advocate the need to mitigate any potential visual impacts on the historic Rideau Canal. The Board's site visits confirmed the potential for visual impacts.

The proponent's counsel submitted that the proposed extension would be constructed to keep such impacts to a minimum. The construction of a several metre high clay berm is proposed around the eastern and southern perimeter of the extension. This vegetated berm is designed to reduce visual impact during the first of two proposed levels of landfilling. The proposed sequence of landfilling (i.e. east to west) would use each completed outer row to screen the landfilling of the subsequent rows (Exhibit 109, p. 4).

In addition, the proponent proposes to plant a series of high-branching deciduous trees along Washburn Road, a hedgerow of evergreen trees to the southeast of the proposed extension, and intermittent clusters of large shrubs inside the landfill fenceline along the Johnson Sideroad. The proposed "Compensation Plan" also provides for landscaping and/or fencing to screen the view of the landfill from individual properties which have noticeable viewpoints.

SCAT, Mr. Bruce, and some of the public witnesses submitted that the proponent's landscaping plan was not sufficient. The death of a row of large trees along the northern property boundary was noted. It was suggested that these trees should be replaced. Mr. Bruce suggested that a larger perimeter buffer should be established and planted to a mixture of native evergreen and deciduous trees. He contrasted the beautiful tree-lined rural roads in the Storrington area with the current and proposed landfill landscape.

Vermin

Several local residents, including Mr. Heaney Senior and Mr. Mundell, testified that rats were a problem until the landfill closed. Another frequent vermin concern was the noise and droppings spread by sea gulls attracted to the landfill site. According to Mr. Bruce, the number of sea gulls hovering around the Washburn Locks had noticeably declined since the Landfill closed.

The proponent proposed to use complete daily cover to discourage rats and sea gulls. In addition, the services of a qualified professional were proposed for routine baiting and extermination. The proponent's area supervisor testified that Laidlaw would actively discourage sea gulls from the landfill area. He proposed to discourage sea gulls by controlling the size of the active disposal area and by employing noise and netting devices, if necessary.

Hours and Access

SCAT submitted that if the Board approves the extension, the landfill should not be open on weekends and Statutory holidays and the daily hours of operation should be constrained. The proponent acknowledged that noise from truck traffic and the operation of the landfill could be mitigated by reducing the hours of operation of the site. However, he noted the other sources of noises in the area from mineral extraction and farming activities. He submitted that unduly restricting the hours of operation could affect the viability of the proposal.

The proponent proposes that the site receive waste from Monday through Saturday between the hours of 8:00 a.m. and 4:00 p.m.. Landfill personnel would require an additional hour on site in both the morning and the evening. This additional two hours would be used to: ensure the necessary equipment is serviced and functional; place the final daily cover; and perform other operational duties. The proponent was willing to restrict heavy equipment operation and construction activities to these hours, except in an emergency.

Laidlaw's Waste Transfer Station in Kingston operates from 8:00 a.m. to 4:00 p.m. Monday through Saturday. The proponent wants the landfill site open on Saturdays to avoid the need to store waste at the transfer station over the weekend. According to Mr. Walters, the transfer station has a limited capacity to store waste. The proponent also wanted the operational flexibility of keeping the landfill open on Saturdays and some statutory holidays.

The proponent referred to other sources of noise and traffic as a justification for the landfill's incremental increase in noise levels. However, if incremental environmental impacts are given cursory consideration, it is inevitable that the tolerances of the community and the environment will be exceeded. The Board recognizes that the intensity, frequency and duration of environmental impacts (eg. noise) are relevant to their cumulative effect. Therefore, the greater the accumulated impacts, the greater the need for preventing or mitigating further impacts.

The Board notes that the surrounding community has endured the impacts of an operating landfill for almost two decades. The Board also has noted the weaknesses in the EA's evaluation of community impacts during the site selection process (Part II). More than a dozen homes are located within an 800 metre radius of the proposed landfill. Although the proponent has

proposed significant mitigation measures, there would be residual impacts. Landfill operations would increase noise, dust and truck traffic in the landfill vicinity and along County Road 12.

These residual impacts could reduce the use and enjoyment of the Washburn Road and Locks and the properties of neighbouring residents. The use of private and public outdoor areas is usually heavier on weekends and statutory holidays. Therefore, if the site operates on these days, the potential impacts on the surrounding community would increase.

Given these circumstances, the proponent's evidence and argument is not sufficient to support the routine opening of the Landfill site on Saturdays and statutory holidays. However, the Board appreciates the difficulties associated with storing the waste in the transfer station or transport trucks over long (3 day) weekends. Therefore, the site could be operated from 9:00 am until 3:00 pm on long weekend Saturdays that are associated with a Friday or Monday statutory holiday.

The Board also believes that the daily operational hours could be designed to reduce the potential impacts on the surrounding community. Therefore, the hours during which equipment could operate at the site, Monday to Friday, would be 7:30 am until 5:00 pm. Waste would only be received between the hours of 8:00 am and 4:00 pm. Waste vehicles arriving at the site before 8:00 am or after 4:00 pm would be denied site access.

The Board recognizes that considerable heavy equipment activity and noise generation could occur during the preparation and closure of sections of the proposed extension. Heavy equipment use (eg. bulldozers, scrapers, compactors) would therefore need to be confined to the hours of 7:30 am and 5:00 pm Monday through Friday.

Monitoring Program for Local Residents' Wells

The proponent agreed to monitor the wells of local residents twice each year upon request. This monitoring is designed to assure the local residents that the landfill site is not polluting their domestic water supply. SCAT's hydrogeologist supported the importance of this monitoring. He believed this precaution would be warranted to ensure that contaminants are not migrating off-site through an undetected bedrock flow system.

The proponent noted that the Host Municipality Agreement with Storrington Township addressed the issue of domestic water supply. This agreement would establish and maintain a \$20,000 fund that could be used by the Township to provide an emergency domestic water supply for residents near the landfill. The fund could be used until sampling confirmed or denied the presence of leachate contaminants in a domestic well.

Since the existing site has a sizable leachate plume, SCAT's hydrogeologist recommended the following monitoring protocol for the wells of local residents:

- The landfill operator shall conduct semi-annual analyses of well water quality, upon request, by a resident living within 1 km of the landfill;
- The analyses shall sample for conductivity, chloride, iron, alkalinity, BOD, COD, benzene, toluene, xylenes, ethylbenzene, and diethyl ether;
- The results of the analyses shall be provided to the residents with a simple interpretation that includes reference to the Ontario Drinking Water Quality Objectives and Guidelines;
- The results of the analyses will be provided in the most timely manner possible;
- If the well water has become contaminated by substances known to be present in landfill leachate, then an independent consultant shall be retained by the Public Liaison Committee (at the landfill operator's expense) to review and confirm the sampling results. A more comprehensive scan shall be carried out to determine the presence or absence of leachate impacts from the landfill; and
- If the consultant concludes that contamination by landfill leachate has occurred, then the landfill operator shall immediately provide an alternate supply of water at the operator's expense. This alternate safe water supply shall be maintained until a water supply of good quantity and quality can be re-established.

Given the prevailing southward groundwater flow, the Board believes these monitoring proposals would be only applicable to the residents living along Washburn Road within 800 metres of the site. Therefore, these proposals would need to be incorporated into any Conditions of Approval.

Response to Public Complaints

A representative of the district MOE abatement office, Mr. Bishop, testified regarding compliance monitoring and complaints response. He did not have the staff resources to provide the level of complaints response and compliance monitoring that the public expected for the Storrington site. An approval subject to complex conditions would place additional demands on the requirements for proper compliance monitoring. Therefore, he recommended the establishment of an independent environmental inspector that would be funded by the proponent. The inspector would be directed by, and responsible to, some independent body such as the Township Council or the Public Liaison Committee.

The proponent's counsel argued that the role of environmental inspection was a legislated mandate of the MOE that Laidlaw supports through taxation. He vigorously objected to the concept of Laidlaw paying extra to subsidize an out-of-company environmental watchdog that would scrutinize Laidlaw's day to day operations.

SCAT supported the concept of an independent environmental inspector funded by the proponent. The many local residents that took an active part in the hearings were not comfortable with delegating the responsibility for complaints response and compliance monitoring to the MOE and the proponent. They argued for independent verification of compliance and complaints.

The social impact assessors for both the proponent and the MOE acknowledged the desirability of independent monitoring and a timely and fair response to complaints. These steps were deemed necessary to ensure: the community retains a sense of control; concerns and complaints are promptly addressed; fairness and accountability are evident; and off-site impacts are prevented.

The concerns expressed by the local residents about the past site operations were both credible and reasonable. The proponent and MOE have been unable to address these legitimate concerns to the public's satisfaction. Therefore, the Board agrees that some form of supplementary complaints response and monitoring would be needed.

Public Liaison Committee

The benefits of having a public liaison committee were not challenged at the hearing. The proponent's counsel viewed the PLC as a communications vehicle between the proponent and the community. The PLC would make recommendations for the avoidance or minimization of off-site impacts. Initially, a committee composition that included an equal number of Storrington councillors and local residents was suggested by the proponent and Storrington Township. However, in final argument the proponent suggested the following PLC composition: 2 members from the proponent; 1 member from Storrington Township Council; 1 member from the MOE; and 3 local residents. The proponent agreed to provide a reasonable annual budget for the operation of the PLC and the payment of stipends for the public members.

Mr. McAllister stressed the importance of a public liaison committee and made the following comments:

But what is really important is that the public liaison committee be viewed as accountable and responsive, and also have the resources to address problems. (Volume 40, p. 145)

Members of the affected community are in the best position to know what is important to them. Someone who might work in an office way from the area might have all the best intentions but might not quite understand how things pan out in the community, what the issues are, and how significant they are. (Volume 40, p. 146) ...

If people feel they are being heard, if there is responsiveness, ...then ... stress and anxiety can diminish over time. (Volume 40, p. 149)

SCAT argued that the local community should have a very strong presence within the PLC committee to ensure the concerns of those most affected would be addressed promptly and fairly. The Board agrees. The following PLC composition would be required: three members (3 votes) and three alternates chosen annually by the residents living within 800 metres (according to Map 4); one representative from the Ministry (the Ministry may designate an alternate) (1 vote); two representatives of the Company and the Company may designate two alternates (2 votes); one non-voting member from the Township of Storrington and one alternate; and a Chair person

chosen by the consensus of all members for a renewable one year term. The Chair will vote only to decide an issue that would otherwise result in a deadlock.

The goal of the PLC should be to work co-operatively towards the avoidance or minimization of offsite impacts from the landfill. The Board also believes that the PLC would need a reasonable yearly allocation of funds to develop a budget and a plan to accomplish supplementary complaints response and monitoring. Independent consultant(s) could be hired on a fee-for-service basis to perform the necessary tasks. These services would be most acutely needed during the development and early operation of the proposed extension. Therefore, if the proposed extension is approved, the proponent would be required to provide \$100,000 during the current year and \$35,000 per year until at least 5 years after the site is closed. The Board would also expect that the public members of the committee would be given a reasonable stipend based on their attendance at meetings.

Compensation Policy

The proponent acknowledged that the proposed mitigation measures would not prevent some residual impacts to property owners within five hundred metres of the proposed extension. Therefore, a Compensation Policy was presented during the course of the hearing. This Policy addressed two main issues: the protection of residential property values within 500 metres of the site; and the property-specific mitigation of nuisance impacts from the proposed landfill extension.

The MOE's social impact expert, Mr. McAllister, indicated that the proponent's compensation policy could be more flexible to facilitate compensation for potential impacts beyond the 500 metre range. He indicated that the list of eligible property owners should be inclusive as opposed to exclusive. The proponent's social impact assessors agreed.

The proposed Compensation Policy (Exhibit 75) contained an impact evaluation matrix that listed properties with potential visual impacts. The evidence of the public witnesses and the Board's site visits indicate that this matrix was not completely accurate. Although the Dark, Kelly, Dusharme and Fletcher residences could suffer potential visual impacts and odour, these properties were excluded from the proponent's eligibility list.

Property Value Protection

The proponent acknowledged that negative impacts on property value may occur within the area in closest proximity to the proposed landfill extension. The proponent's economic impact consultant estimated a potential property devaluation of 5% to 10% (Exhibit 106) within approximately 500 metres.

SCAT's property value expert, Mr. Rayner, also concluded that the proposed extension would have a negative impact on property values. He examined property purchases at various distances from the site and concluded that:

- the effects are greatest in close proximity to the site and diminish relatively rapidly as distance from the site increases;
- the impact appears to range from 3% to 23% with the largest impact being within 200 metres of the site;
- there is no evident impact beyond 1.5 kilometres; and
- property values along County Road 12 do not appear to be impacted by the Landfill site (Volume 54, p.150).

The Estabrook property to the southwest and the Preston property to the southeast are both within two hundred metres of the proposed landfill extension. If the landfill reopens, Mr. Rayner suggested that these properties would become virtually unmarketable and therefore he recommended their acquisition by Laidlaw.

Another four residential properties are located within 500 metres of the proposed extension: Mundell, Heaney Junior, Smith and Lubimiv. Mr. Rayner noted these properties and additional properties within approximately 1.0 kilometres of the site along Washburn Road. If the landfill extension is approved, he expected a decline in the value of these properties.

The proponent proposed a "Property Value Protection Program" to mitigate the potential for property devaluation. The proposed property value protection plan includes the following provisions:

Laidlaw and the Eligible Property Owner will agree on the fair market value of the property prior to the property being listed for sale;

The fair market value will be determined as follows:

Two appraisals, one on behalf of Laidlaw and one on behalf of the Eligible Property Owner, will be obtained and paid for by Laidlaw. If the appraisals vary by more than 25% and the average of the two appraisals is not acceptable to either Laidlaw or the Eligible Property Owner, then a third appraisal shall be made. The third appraiser shall be chosen by the first two appraisers and paid for by Laidlaw. The fair market value will be the average of the two closest appraisals;

All appraisals shall be determined according to sales of comparable properties in comparable communities where there is no landfill;

The Eligible Property Owner shall list his/her property for sale with a knowledgeable real estate agent in the area;

The property must be listed with the realtor for six months;

Any purchase offers received during the six month period must be submitted to Laidlaw for review if the offers are less than the fair market value. As expeditiously as possible, Laidlaw will decide to either: (a) accept the offer and pay the difference between the accepted offer and the fair market value; (b) reject the offer; or, (c) acquire the property at fair market value;

If no acceptable offer is received during the six month period, Laidlaw will acquire the property at fair market value;

An Eligible Property Owner may sell his/her property to anyone at any time without allowing Laidlaw the first right of refusal. In that event, Laidlaw is under no obligation to provide property value compensation to the Eligible Property Owner; ...

SCAT's expert had suggested a similar property value protection plan with a few notable differences. He noted that an appraisal would also be warranted to establish the value of property as collateral for a loan. The choice of a 25% differential between appraisal values was also questioned. Mr. Rayner testified that 5% is the standard variation for relocations and expropriations.

The proponent's property value protection plan listed twelve eligible property owners. These eligible properties were within approximately 500 metres of the site along Washburn Road. Mr. Rayner had suggested a larger eligibility zone that would include approximately 16 properties.

A local resident, Mr. Mundell, raised the issue of property value and refinancing during the hearing. He testified that the amount of money he could borrow was reduced due to the landfill site's impact on the appraisal of his property's value.

The Board believes that evidence provided by SCAT's consultant and Mr. Mundell suggested some desirable improvements to the proponent's proposal. Therefore, the proponent's proposed property value protection plan would need to be revised by:

- requiring a third appraisal if the differential between the first two appraisals is greater than 10%;
- applying the appraisal procedure to property owners that wish to finance a loan based on the appraised value of their home; and
- the eligible properties shall include the residential properties located within 800 metres of the Site along the Washburn Road including the Dark, Kelly, Dusharme, and Fletcher properties.

Financial Compensation vs. Property-Specific Mitigation

The proponent acknowledged that the noise, dust, and other nuisance impacts of the landfill could not be fully confined to the Landfill property. Therefore, the proponent proposed a compensation policy to provide property-specific mitigation measures for nearby residents. These improvements could involve: triple pane windows to reduce noise impacts; air conditioning to reduce dust impacts; and landscaping and/or fencing to reduce visual impacts.

According to the proponent, the proposed compensation policy would respond to individual sensitivities and concerns of impacted property owners and their family members. In addition, if a person outside the prescribed compensation zone suffered damage related to the landfill, the proponent would provide compensation.

SCAT noted the landfill's potential cumulative impact on the serene character of the local neighbourhood. According to SCAT, the proponent's compensation policy would be intrusive, requiring the proponent's agreement on mitigation measures that would be funded. SCAT argued that the affected property owners are in the best position to determine the appropriate form of the compensation. The local residents suggested financial compensation through the establishment of a "Benefits Trust Fund".

The proposed Benefits Trust Fund would collect a small percentage of the tipping fee for each tonne of waste landfilled and the collected money would be administered by an independent trustee. The annual value of the fund would be approximately \$130,000. Property owners experiencing the greatest levels of residual impacts would receive the greatest compensation based on a weighting formula.

The following testimony of the Social Impact Assessment expert for the MOE is relevant to the issue of financial compensation versus impact mitigation (Volume 40 p. 235):

I guess there is a sense of stewardship. If you have people in the area you can monitor impacts. You don't want to buy people out because you can end up in a situation where people ignore impacts when the objective is to avoid them.

The Board agrees with this statement. If the proponent financially compensates local residents for potential impacts, the motivation to minimize the residual impacts may be reduced. The EA hearing benefited from the contribution of a concerned and knowledgeable community. The community around the proposed Storrington Landfill made a significant contribution to the "betterment of the whole" of Ontario by effectively advocating for the protection of their "part" of Ontario. The Board has concerns about the potential proliferation of financial compensation, particularly if it is employed prior to completion of the Government EA Review. A vigilant local community provides an important early warning system for potential environmental problems. If proponents utilize scarce resources for financial compensation prior to thorough impact mitigation, then the objectives of the *EA Act* would be undermined.

Proponents should thoroughly evaluate innovative ways of reducing potential impacts at their source before off-site mitigation is considered. Compensation should be considered only if all other practical solutions and mitigation measures have been addressed. After considering the purpose and provisions of the *EA Act*, the Board concludes that the proponent's plan for property-specific mitigation is more appropriate than SCAT's proposal for financial compensation.

ECONOMIC IMPACT ASSESSMENT

The proponent submitted that the Storrington Landfill extension would have a positive economic impact on the municipalities in the proposed service area. The predicted cost of depositing waste at Storrington was significantly less than the current cost of transporting waste to another jurisdiction for disposal. The proponent's economic impact consultant estimated an annual savings of \$730,000 for the City of Kingston, \$300,000 for the Township of Kingston and \$80,000 for the Township of Storrington.

The importance of local landfill capacity was addressed by a representative from the Kingston District Chamber of Commerce during one of the public hearing sessions. Local businesses view landfill capacity as a vital utility that affects the cost of doing business. In the opinion of the representative for the Chamber of Commerce, communities that deal effectively with their waste enjoy a competitive advantage. This opinion was echoed by representatives from the Kingston Frontenac Builders Association and the Kingston Construction Association.

The proponent signed a Host Municipality Agreement with Storrington Township during the first phase of the hearing. Pursuant to this agreement, Storrington Township would receive 4% of the gross landfill revenue, free waste collection services from Laidlaw for five years and the ability to impose a tipping fee premium of approximately \$16 per tonne on other users of the landfill. The proponent's economic impact consultant testified (Volume 29, pp 26 -27):

... \$16 a [tonne] on the municipally hauled waste alone would generate revenue for Storrington in the order of \$400,000 a year. To the extent the \$16 a [tonne] was to apply to the industrial commercial waste, it would generate a further revenue to Storrington in the order of 600,000 a year ... perhaps a little more than a [total of a] million dollars a year, potentially \$15 million for Storrington over the life of the site.

Other potential economic stimuli that were noted, included: the labour and equipment that would be needed to construct the landfill extension and to upgrade the adjacent Johnson sideroad; the pollution abatement technology that would be purchased and installed at the site; the local aggregate and cover materials that would be purchased; the additional landfill personnel required; and the environmental engineering, consulting and monitoring services that would be needed.

The proponent, the City of Kingston and the Township of Kingston submitted that the potential economic costs and benefits to the larger community should factor into the overall assessment of potential environmental impacts. SCAT submitted that the Board should give the most weight to the interests of the local community, since the local community is directly impacted by all three facets of the *EA Act's* definition of environment. According to SCAT, the social, ecological and economic costs represented by the local community's interests are most relevant to the purpose of the *EA Act* and the Board's determinations.

Revenue Generation and Costs

The proponent noted the economic implications of reducing the capacity of the proposed landfill extension or requiring the implementation of costly contingency measures for impact mitigation. Reduced revenue potential and increased costs could undermine the profitability and viability of the proposal.

In Part II, the Board considered the evidence and concluded that the proponent had established a need for landfill capacity of only 600,000 tonnes over a period of approximately seven years. Therefore, the potential gross revenue was significantly reduced from the capacity and term that had been requested (i.e. 980,000 tonnes, 10 years). The Board recognizes that the reduced capacity may have a significant impact on the proposal, however, the evidence and the proponent's EA did not support a larger capacity or a longer term.

Another economic issue was the effect of additional mitigation costs. The proponent has made some allowances for revenue adjustment to accommodate additional costs. A document was attached to the Supplementary Waste Disposal Contract (May, 1991) between the City of Kingston and the proponent. This document (proforma) established a procedure to enable the proponent to adjust tipping fees in accordance with certain hearing and approval related expenses. For example, the proforma specifies a \$5 million allowance for a biological contactor leachate treatment process.

The City and the Township of Kingston's initial support for the extension was based on the full mitigation of impacts to the Storrington community and the natural environment. The potential mitigation costs became more apparent by the end of the hearing. In final argument, the City and Township of Kingston expressed concerns about the effect of full impact mitigation on the cost of waste disposal in the Kingston area.

Financial Assurance

MOE Policy 14-15-01 stipulates that engineered landfill facilities must function as long as necessary to protect the environment. Therefore, sufficient funds must be available for operating and maintaining these facilities throughout the contaminating lifespan of the site. The contaminating lifespan is the time period during which a landfill produces contaminants at levels that could have an unacceptable impact if these contaminants were discharged to the surrounding environment. The evidence indicated that the contaminating lifespan of a landfill can extend for more than over half a century.

In final argument, counsel for the MOE submitted that either the Board and/or the MOE could require financial assurances. The MOE noted that financial assurance is mandatory for private landfills in excess of 40,000 cubic metres. The MOE's concern, based on experience, is that

a private landfill operator could profit from the operation of the landfill site without making sufficient financial provisions for the long term care of the landfill. If the private operator subsequently goes bankrupt or abandons the site, the public incurs the financial liability of the long term care of the site.

The proponent made certain operational and post-closure cost predictions in the proforma attached to the Supplementary Waste Disposal Contract (1991). In addition, the proponent predicted total closure and post closure costs of approximately \$3.7 million in Exhibit 78. The Board notes that the \$3.7 million cost was based on a contaminating lifespan of thirty years. The evidence indicates that thirty years is near the low end of the potential contaminating life span. The Board believes that it would be more prudent to assume a contaminating life span of at least fifty years, particularly for a landfill site that is located in close proximity to rural residential land uses, the Rideau Canal and the provincially significant Washburn Wetland.

Exhibit 78 did not account for the potential costs of installing and maintaining pollution abatement contingencies such as: an active gas collection and combustion system for the existing and proposed sites; a purge well system; and a larger capacity RBC with a tertiary treatment system for phosphorus removal. However, the following cost estimates were eventually presented (Exhibit 204): RBC system - \$2,638,000; purge well system (4 wells) - \$500,000; tertiary treatment system - \$884,000; and active gas collection (existing site) - \$1,000,000. These costs total approximately \$5 million.

The Board notes significant variability between the cost estimates in Exhibit 78, Exhibit 204 and the proforma attached to the Waste Disposal Contract. For example, the yearly maintenance cost for the RBC Leachate Treatment Facility was estimated as \$500,000 per year in the proforma, approximately \$55,000 per year in Exhibit 78 and \$45,000 per year in Exhibit 204. After reviewing the variations in these costs, the Board is not confident that the proponent's estimates were accurate.

According to the MOE, financial assurance is required for both the operational and post-closure period of a landfill site. The proponent agreed to provide financial assurance in the form of a \$5 million irrevocable letter of credit. The MOE appeared to be satisfied with this arrangement over the operational period. However, the MOE noted that a trust fund would have to be established prior to the closure of the site. The trust fund would provide financial assurances for the proper operation and maintenance of any necessary pollution abatement facilities over the site's contaminating life span.

Exhibit 204 provided the following estimates of annual operating costs for pollution abatement measures and contingencies: RBC system - \$45,000/year; purge well system - \$32,000/year; tertiary treatment system - 65,000 /year; and active gas collection \$25,000/year. If these estimated operating costs are projected over a fifty year period, the total cost would exceed \$8 million.

The evidence supports the need for a \$5 million irrevocable letter of credit to provide financial assurance during the operational period of the landfill site. The amount of the post-closure trust fund should be based on accurate predictions of the projected operating and maintenance costs over a contaminating lifespan of at least fifty years. Otherwise, future generations may be burdened with the environmental and financial liabilities created by the current generation.

BOARD CONCLUSIONS ON ECONOMIC IMPACT ASSESSMENT

The economic factors noted by the proponent and the potential users of the Storrington site are relevant. However, there are additional economic interests that must be considered to achieve the purpose of the *EA Act*. Over ten million dollars of the potential landfill revenues were allocated to Storrington Township to secure the Host Municipality Agreement. The potential costs to prevent adverse environmental and social impacts are similar in magnitude. The Board believes that costs incurred in preventing and mitigating environmental and social impacts are most consistent with the purpose of the *EA Act*.

If social and environmental costs are not properly factored into waste management decisions, waste diversion and reduction initiatives will be undermined and landfill sites will continue to be viewed as an utterly unacceptable neighbouring land-use. The failure to account for these costs in the past has polarized proponents and potentially impacted communities and mobilized

complex social and political forces. This polarization has resulted in a costly, contentious and time-consuming waste management planning process. The Board notes the merit of the following comments by the MOE's social impact assessment specialist (Volume 40, p. 59):

... there is a cost to society of unresolved conflict and there's a cost to public institutions when conflicts are not resolved in a way the public can accept - they might not like it but they can accept it - the credibility of public institutions begins to diminish and conflicts and divisions increase in society ...

If the inequities that lead to such conflict are to be reduced, the social and environmental costs of landfill capacity must be accounted for in waste management planning and decision-making. The proposed Storrington extension is in close proximity to the Rideau Canal, several rural residences, the Storrington swamp and stream, and the provincially significant Washburn wetland. The close proximity of these sensitive environmental features should have alerted the proponent to the potential for significant mitigation costs during the site selection process. However, the potential costs of preventing adverse impacts to these receptors were not thoroughly integrated into the proponent's EA process until during the hearing.

CUMULATIVE IMPACT ASSESSMENT

The evaluation of cumulative impacts is a component of environmental assessment that is growing in importance. The Board recognizes that a number of impacts that may separately seem inconsequential can collectively result in significant adverse impacts.

The evaluation of cumulative impacts is facilitated by the existence of environmental objectives and guidelines that are based on ecological principles and public interests. These guidelines and objectives help to define the tolerance limits or "carrying capacities" of various components of the environment. If tolerance limits are exceeded, then by definition, undesirable and perhaps unacceptable environmental impacts will occur.

The Board has considered a number of standards that are relevant to the assessment of cumulative impacts, including: the Provincial Water Quality Objectives for surface water; the MOE Reasonable Use Policy for groundwater; the MOE Policy for noise; the MOE Point of Impingement Standards for air quality; and the Provincial Wetlands Policy. The Board has also considered: the historical, current and probable future sources of impact from the landfill; the non-landfill related sources of impact; the frequency, duration and magnitude of potential impacts; and the sensitivity and assimilative capacity of surrounding environment.

The evidence reveals that the natural assimilative capacity (tolerance) of the surrounding environment has been diminished by two decades of landfilling and by other local activities (eg. farming, aggregate extraction). Several environmental features are already approaching or exceeding their limits of tolerance. For example: the nearby Rideau Canal contains phosphorus levels that exceed the maximum desirable concentrations specified by the Provincial Water Quality Objectives; the groundwater beneath the proponent's property is being utilized to dilute the leachate plume from the existing site; and the surrounding community is receiving landfill gas and odours from the closed and capped portion of the site.

The proponent's EA process failed to thoroughly consider the mitigation costs that would be required to prevent unacceptable cumulative impacts to the social and natural environment. However, the hearing process resulted in the introduction of a number of positive and innovative measures for preventing or minimizing environmental impacts. For example: tertiary treatment of RBC effluent for phosphorus removal; purge wells for capturing the leachate plume from the existing site; and active gas collection and controlled combustion for odour and landfill gas abatement.

The proponent asked the Board to defer the requirement for these technologies until less expensive experimental alternatives were proven ineffective. However, the Board notes the following quote from a book entitled *The Environmental Policy Paradox* (Smith. Z.A., 1992):

Deferring action on serious environmental problems is very much like accumulating debt. Eventually the debt must be paid off.

A fine balance exists between the weight of evidence supporting the approval of this undertaking and the weight of evidence supporting its rejection. The Board has carefully weighed the evidence in light of the purpose of the *EA Act*. The Board believes that the cumulative environmental impacts of the Storrington Landfill extension can be prevented, mitigated or remedied. However, the fine balance can only be tipped towards approval based on the implementation of thorough measures for preventing and mitigating environmental impacts. In the absence of these measures, the proposed extension would result in unacceptable cumulative impacts to the local community and the natural environment.

Reliability of Conditions of Approval

The intervenors asked the Board to consider the reliability of Conditions of Approval. They noted that the Board's Conditions of Approval could subsequently change at the discretion of the MOE Director. In the past, important changes to the Certificate of Approval for the Storrington Landfill have occurred without public notice and consultation.

The Director's legislated mandate provides significant discretionary powers for reasons of administrative flexibility. However, the Conditions of Approval developed after a rigorous public hearing process should only be changed with great caution and after notifying and consulting with the potentially affected public. Otherwise, the reliability of Conditions of Approval will be undermined in the eyes of the public and the Board.

SCAT also noted apparent discrepancies between promises and predictions made at past hearings and post-approval actions and effects. The Board was asked to consider the potential differences between promises and performance before making a decision.

The Board believes the concerns raised by SCAT and the public are valid. However, these concerns can be addressed by thorough Conditions of Approval. The Conditions of Approval will facilitate the development of a Public Liaison Committee. This Committee will receive funding for compliance monitoring and other tasks related to impact prevention and mitigation.

FINAL DETERMINATION AND DECISION

The Board has carefully weighed the evidence in light of the purpose of the *EA Act*. The Board believes that the potential environmental impacts of the Storrington Landfill extension can be prevented, mitigated or remedied to provide for the protection, conservation and wise management of the environment. However, the approval can only be granted subject to thorough Conditions of Approval.

The Board fully expects that the proponent, the MOE, Storrington Township, the local community and the other relevant government agencies will co-operate to fully implement the requirements of the Board's decision. The terms and conditions prescribed by the Board are necessary to avoid unacceptable environmental impacts to: the surrounding rural community; the long term quality of domestic well water and groundwater resources; the provincially significant Washburn Wetland; the nearby Rideau Canal; and the Storrington Swamp and stream.

Therefore, the Board approves the proposed extension of the Storrington Landfill subject to the following terms and conditions. The Board also Orders that Storrington By-law 1978-15 as amended by By-law 1986-17 should not apply to the Landfill extension.

DATED at TORONTO this 31st DAY of MARCH, 1993.

"Jim Robb"

Jim Robb

"Elaine Tracey"

Elaine Tracey

PART V - CONDITIONS OF APPROVAL

RE LAIDLAW/STORRINGTON ENVIRONMENTAL ASSESSMENT

Definitions

EA Act means the *Environmental Assessment Act*.

Board means Environmental Assessment Board

EP Act means the *Environmental Protection Act*.

Company means Laidlaw Waste Systems (Storrington) Ltd. and its successors and assignees.

Director means the Director of the Approvals Branch of the Ministry of the Environment and Energy.

District Officer means the District Officer of the Kingston District Office, Ministry of the Environment and Energy.

Landfill means the Storrington Landfill Site comprised of part of lot 18, concession VII, in the Township of Storrington, County of Frontenac.

Ministry means the Ontario Ministry of the Environment and Energy.

MNR means Ministry of Natural Resources

ODWO means the Ontario Drinking Water Objectives

OWR Act means the *Ontario Water Resources Act*.

PWQO means the Provincial Water Quality Objectives

PLC means Public Liaison Committee.

Regional Director means the Director of Southeastern Region, Ministry of the Environment and Energy.

CHANGES TO THESE CONDITIONS OF APPROVAL

1. The Company shall comply with these Conditions of Approval specified pursuant to the Board's powers under the *EA Act*. These are minimum conditions. The Director retains jurisdiction to specify additional conditions before granting final site approval under Part V of the *EP Act*.
2. The Director or the Company shall give formal Notice to the members of the PLC regarding any proposed changes to the Conditions of Approval. Any proposed changes to the Conditions of Approval shall be reviewed by the Public Liaison Committee.

CLOSURE DATE

3. The Landfill shall close on, or before, December 31, 2000.

APPROVED CAPACITY

4. The Landfill shall receive a maximum of 600,000 tonnes of waste.

SERVICE AREA

5. Waste may be received for disposal from the following municipalities only:

The City of Kingston;	Kingston Township;
Storrington Township;	The Town of Gananoque;
Pittsburgh Township;	Ernestown Township;
South Fredericksburgh Township;	Adolphuston Township;
Wolfe Island Township;	Amherst Island Township;
Howe Island Township;	Camden East Township;
Loughborough Township; and	Portland Township.

TYPES OF WASTE

6. The landfill site may be used for the disposal of the following categories of waste only: solid, non-hazardous domestic, commercial, industrial and institutional waste and the carcasses of animals certified as non-infectious by a licensed veterinarian.

7. The Company shall co-operate with the users of the Landfill to divert potentially hazardous domestic waste (eg. batteries, paint, solvents, pesticides, aerosols) from the waste stream. Potential diversion measures would include: a hazardous waste depot at the transfer station; and the development of a residential and ICI hazardous waste collection programme.

SITE SECURITY, ACCESS AND HOURS OF OPERATION

8. The Company shall maintain fencing and secure the Landfill site to deter illegal entry. The entrance to the Landfill shall be securely locked when the site is not operational.
9. The Company shall ensure that all waste accepted for disposal at the Landfill has been previously inspected, weighed, and compacted into transport trailers at the Kingston Waste Transfer Station.
10. No waste shall be accepted, landfilled or removed from the Landfill unless a site supervisor is present to supervise the operation. The Landfill site shall be closed when a designated site supervisor is not present.
11. The operating hours of the site shall be, Monday to Friday, 7:30 am until 5:00 pm.. Waste shall only be received between the hours of 8:00 am to 4:00 pm. Waste vehicles that arrive at the site before 8:00 am or after 4:00 pm shall not be granted access to the site.
12. The site shall be closed on Sundays and all statutory holidays. The site shall also remain closed on Saturdays, with the exception of Saturdays that are associated with a Friday or Monday Statutory holiday. In this case, the landfill site may operate on Saturday from 9:00 am until 3:00 pm and waste may be received between the hours of 9:30 a.m. and 2:00 p.m..

WEIGH SCALES

13. The Company shall install and use weigh scales to record all incoming wastes. If the on-site scales malfunction, alternative methods for weight determinations must be made and the District Officer shall be contacted immediately.
14. Vehicles shall be identified by license number on the weigh scale certificates at both the transfer station and the Landfill Site.

SOCIAL IMPACT CONTROL

Public Liaison Committee (PLC)

15. The Company shall take all reasonable steps to form the PLC prior to the construction and development of the landfill extension. The goal of the PLC should be to work co-operatively towards the avoidance of off-site impacts from the Landfill.
16. The PLC shall have the following membership: three members and three alternates chosen annually by the residents living within 800 metres of the site (3 votes); one representative from the Ministry (the Ministry may designate an alternate) (1 vote); two representatives of the Company (the Company may designate two alternates) (2 votes); one non-voting member from the Township of Storrington and one alternate; and a Chair person chosen by the consensus of all members for a renewable one year term. The Chair will vote only to decide an issue that would otherwise result in a deadlock.
17. Prior to the commencement of site preparation, the Company shall provide \$100,000 for the operation of the PLC during 1993/1994. Thereafter, the proponent shall provide the PLC with yearly funding of \$35,000 until at least five years after the site is closed, capped and vegetated. Any surplus funds at the end of a given year shall be added to the funding for the following year. Surplus funds remaining five years after the site closes shall be utilized for any ongoing operation of the PLC or shall be deposited to the post closure trust fund required by the Ministry.
18. The general mandate of the PLC shall be as follows:
 - 18.1 to meet on a regular basis (eg. monthly) on dates that are predetermined by the committee, to record the minutes of such meetings and to democratically carry out the tasks of the PLC;
 - 18.2 to develop an annual budget and a disbursement control system for accomplishing: better complaints response; independent monitoring of groundwater, surface water, gas, ecology; independent interpretation of monitoring information; waste reduction and diversion awareness and initiatives; newsletter production and distribution; and landscape and habitat enhancement projects around the landfill;
 - 18.3 to determine and allocate a modest stipend for the public members of the committee and the Chair based on attendance at meetings;

- 18.4 to select and direct independent consultant(s) for the purposes of supplementary complaint's response, monitoring, independent advice and reporting to the PLC and the Ministry;
 - 18.5 to promptly and cooperatively exchange information between the PLC members regarding ongoing site development, operation, management, complaints and monitoring;
 - 18.6 to develop a protocol for hearing and promptly acting on complaints and concerns regarding the ongoing development, operation, management and monitoring of the site;
 - 18.7 to publish a newsletter addressing the aforementioned subjects at least twice a year and distribute the newsletter to residents living within two (2) kilometres of the landfill;
 - 18.8 to publish an annual report that summarizes the yearly activities and findings of the PLC and provides a financial statement; and
 - 18.9 to provide input to Ministry officials regarding any necessary changes to the Landfill's Certificate of Approval and associated Conditions of Approval. .
19. The PLC and the independent environmental consultant(s) retained by the PLC shall have reasonable access to monitor the Landfill site and its facilities. The functions of the independent consultant(s) should include:
- 19.1 Attending specified meetings of the PLC in a non-voting advisory capacity;
 - 19.2 Monitoring compliance with the conditions of approval of the Certificate of Approval;
 - 19.3 Conducting supplementary monitoring of groundwater, surface water, air quality, noise, etc.;
 - 19.4 Reporting to the District Officer and the PLC on all incidents of non-compliance with applicable statutes, regulations and the conditions of approval;
 - 19.5 Reviewing data associated with groundwater, surface water, gas and noise monitoring, and reporting to the District Officer and PLC on any data which indicate actual or potential compliance problems;

- 19.6 Preparing written inspection reports for submission to the Public Liaison Committee and the District Officer on a monthly basis, or more frequently as may reasonably be required by the Regional Director; and,
- 19.7 Assisting in the preparation of the PLC annual report for submission to the Regional Director, the local community, the Township of Storrington, and the Company.

Complaints Response

20. The entrance to the site shall have a prominent sign that provides a 24-hour emergency phone number for registering complaints and for notifying the Company of problems concerning the Landfill. The Company shall refine its protocol for recording and responding to complaints after consultation with the PLC.

Traffic Control

21. The Company shall co-operate with the Township to ensure that Johnson Sideroad is paved prior to the opening of the landfill extension and preferably before the commencement of construction activities for the extension. The Company shall co-operate with the Township to ensure the proper maintenance of the Johnson Sideroad during the operating life of the site (i.e. until December 31, 2000).
22. The Company shall install a stop sign at the exit from the Landfill site and take any other steps necessary to ensure landfill traffic yields the right-of-way to local traffic using the Johnson Sideroad.
23. The Company shall take any necessary steps to ensure that refuse vehicle operators observe local speed limits and demonstrate safe and courteous driving habits.
24. The Company shall promptly respond to any complaints and take disciplinary action, if needed, to ensure the safe and courteous operation of vehicles using the Site.
25. Refuse shall be compacted into transport trailers at the Dalton Transfer Station before transport to the Landfill via Highway 15, County Road 12 and Johnson Sideroad. Landfill refuse vehicles shall not use the Washburn Road.

26. With the exception of a three week period during the initial construction of the Landfill extension, the proponent shall limit the daily number of cover material and aggregate trucks to less than fourteen (14). The Company shall take the necessary steps to ensure that trucks carrying cover material or aggregate to the Landfill do not use the Washburn Road.

Litter control

27. The Company shall take all necessary steps to prevent off-site litter impacts from the landfill operation.
28. Landfill related litter shall be picked up daily: from surrounding land and water; along the Johnson Sideroad; and on Washburn Road south of the extension area. Upon consent of an affected property owner, the Company shall remove any litter caused by the Company.
29. Litter shall be picked up at least weekly from all surrounding roads within 500 metres of the property boundary.
30. Litter control fencing with a minimum height of 3.5 metres shall be used at the active face to prevent litter from blowing off-site.
31. Disposal of waste at the landfill site shall cease if weather conditions make it difficult to prevent litter from leaving the Landfill site.

Dust Control

32. On-site roads shall be treated with water and/or dust suppression materials as required to minimize dust generation.

Noise Control

33. The Company shall take all reasonable steps to develop and implement a safe alternative to the regular use of back-up beepers on Landfill equipment.
34. The operation of heavy equipment and the generation of noise shall be restricted to Monday to Friday 7:30 a.m. to 5:00 p.m., with the exception of Saturdays that are associated with a Friday or Monday statutory holiday. In this case, the generation of noise shall be restricted to 9:00 a.m. to 3:00 p.m..

35. All equipment associated with the development, operation and closing of the site shall comply with relevant noise abatement standards.

Vermin Control

36. The services of a qualified professional shall be employed, as needed, to control rats.
37. The Company shall take all reasonable steps to discourage sea gull congregation at the Landfill site.

Visual Impact Control

38. The Company shall establish and maintain a vegetated buffer around the perimeter of the landfill site. The vegetated buffer shall be established in the spring and fall of 1993 by:
- 38.1 Erecting sediment control fencing fifteen metres inside the existing fenceline along the southwestern, southeastern and southern property boundaries. This buffer area shall be carefully protected from landfill development and operations;
 - 39.2 Alternately planting fast growing hybrid poplar trees and hardy native deciduous trees (eg. red maple) at seven to ten metre spacings just inside the southern, southwestern and southeastern fenceline;
 - 39.3 Planting groups of white cedar at several metre spacings and set-back at least ten metres from the deciduous tree plantings along the southern, southwestern and southeastern fencelines;
 - 39.4 Alternately planting fast growing hybrid poplar trees and hardy native deciduous trees at several metre spacings just within the western and northern fenceline;
 - 39.5 Planting clumps of hardy native deciduous trees and shrubs (eg. hybrid poplar, staghorn sumach) and white cedar along the lower eastern slope of the existing landfill;
 - 39.6 Alternately planting fast growing hybrid poplar trees and hardy native deciduous trees at several metre spacings along the southern and southwestern perimeter of the proponent's buffer lands to the east of Johnson Sideroad;
 - 39.7 Arranging the plantings to facilitate future access to monitoring wells and to permit the construction and maintenance of the drainage ditches, culverts and leachate forcemain;

- 39.8 Providing supplemental spray watering, if needed, to remove dust and reduce stress during the first year after planting;
 - 39.9 Replacing trees that do not thrive and recording the probable cause of mortality; and
 - 39.10 Planting clumps of hardy, self-colonizing native shrubs (eg. staghorn sumach) on side slopes that are progressively capped to improve aesthetics, stabilize soils and displace nuisance weeds.
40. In addition to the large berm specified in the proponent's conceptual plan, small berms shall be constructed on each working elevation on the east, west and south sides of the landfill site. These berms shall act as line-of-site barriers to neighbouring residences and the Rideau Canal.

Compensation

41. The Company shall implement the Compensation Policy submitted to the Board by the Company, subject to the following amendments:
- 41.1 All residents living along the Washburn Road within the 800 metres of the Landfill site shall be "Eligible Property Owners" with regard to Compensation Policies submitted by the proponent and reproduced in Appendix G of the Decision. An amended list of Eligible Property Owners is attached to these Conditions as Schedule A;

Damage Claims

- 41.2 Damage claims are not restricted to "Eligible Property Owners";
- 41.3 The Company shall complete any monitoring associated with a damage claim within 60 days of receipt of the claim;
- 41.4 If there is a dispute between the individual and the Company, the PLC shall have an opportunity to settle the complaint prior to the PLC's selection of an arbitrator; and,
- 41.5 The damage claim shall be settled no later than 90 days from the Company's receipt of the claim.

Property Value Protection

- 41.6 A third appraisal shall be required if the differential between the first two appraisals is greater than 10%;
- 41.7 The appraisal procedure shall be applied, upon request, to an eligible property owner that is financing a loan based on the appraised value of the property; and
- 41.8 The policy shall remain in force until three years following the final closure of the Landfill site.

LANDFILL DESIGN AND OPERATIONS

Landfill Liner

- 42. The Company shall retain a geo-technical engineer to perform predesign testing on the proposed Landfill liner and to submit a written report of the results to the Director. Prior to approval, the Director shall be satisfied that the proposed liner is capable of performing according to the conceptual design presented to the Board (i.e. hydraulic conductivity 10^{-9} metres/second). The report of the geo-technical engineer shall include the following:
 - 42.1 Design and construction of a test pad or an alternative acceptable to the Director;
 - 42.2 Results of lab and field testing of the test pad's performance (eg. hydraulic conductivity);
 - 42.3 Results of the leachate compatibility testing;
 - 42.4 Detailed design and construction plans for the liner;
 - 42.5 Quality Assurance and Control programs;
 - 42.6 Monitoring procedures; and
 - 42.7 Contingency plans.
- 43. The Company shall submit the liner report and the final design specifications for the approval of the Director prior to the commencement of liner construction.

44. Landfilling shall not commence until the following requirements have been satisfied:
- 44.1 A geotechnical engineer or other qualified professional has certified that the landfill base and liner have been constructed according to the methods and quality control standards approved by the Director; and
 - 44.2 Approval to proceed with landfilling has been given by the Director.
45. The construction of the landfill liner and the placement of waste shall be designed to prevent leachate escape to temporarily unlined portions of the Landfill area (eg. other cells not yet constructed).

Leachate Collection System

46. The leachate collection system shall be constructed, operated and maintained to minimize leachate accumulation above the landfill liner.
47. The aggregate blanket and filter cloth (geotextile) above the leachate collection system shall be sloped towards the perimeter leachate collection pipes to ensure proper leachate drainage in the event of filter cloth clogging.
48. The leachate collection system piping shall be resistant to chemical and physical degradation (eg. High Density Polyethylene (HDPE)). The piping shall be designed to withstand the anticipated loadings and function throughout the contaminating lifespan of the Landfill extension.
49. Precautionary steps shall be taken during the placement of the first layer of waste to reduce the potential for physical damage or clogging of the leachate collection system.
50. The ongoing operation of the leachate collection system shall be monitored monthly for leachate mounding by the establishment and maintenance of a leachate depth monitor in an area that is suitable to the Ministry.
51. The leachate collection system shall be inspected and maintained regularly throughout the contaminating lifespan of the Landfill according to a schedule that is specified by the Director.

Leachate Sumps and Forcemain

52. Separate leachate sumps shall be provided for the leachate collected from the existing site and the extension area.
53. Each sump shall employ a two pump system and a high level alarm that alerts the Company via telephone when leachate levels are abnormally high. The Company shall have a protocol that is acceptable to the Ministry for routine pump maintenance and replacement, and emergency pump servicing and replacement.
54. The leachate forcemain shall be designed and routed to avoid accidental construction damage, to avoid leachate heat loss, to avoid disruption to the vegetated perimeter buffer area and to facilitate detection and repair of any leaks.

Purge Wells

55. The Company shall apply for the necessary Ministry approvals for the design, construction, operation and maintenance of two purge wells. The purge wells shall be installed in the vicinity of the Washburn Road to begin intercepting and capturing the existing leachate plume as soon as possible.
56. The purge wells shall be installed in locations that maximize contaminant capture from the leachate plume and minimize further disturbance to the Storrington Swamp.
57. The pumping rates for the purge wells shall initially be approximately 150 litres/minute each and shall be refined through consultations with the Ministry and the PLC.
58. The need for the additional two (2) purge wells shall be triggered by the following protocol:
 - Step 1 If monitoring of any boundary groundwater monitor shows that the 60% Reasonable Use Policy (RUP) limit has been reached for any parameter, then quarterly sampling shall commence at that monitor.
 - Step 2 If three consecutive exceedances of the 60% RUP limit are recorded for any parameter at any boundary monitor, or if the concentration of a parameter increases from 60% to 80% of the RUP in successive sampling events at any boundary monitor; then construction and testing of the additional purge wells shall commence.

Step 3 If three consecutive exceedances of the 80% RUP limit are recorded for any parameter at any boundary monitor, then the additional purge wells shall be activated.

59. The contaminated groundwater captured by the purge wells shall be treated by the RBC treatment facility.

Leachate Treatment

60. The Company shall obtain the necessary approvals (eg. *OWR Act*) for the design, construction, operation, maintenance and monitoring of a leachate treatment facility. The facility shall include the "Rotating Biological Contactor" technology and the "Tertiary Treatment" technology proposed by the proponent and revised by these Board conditions.
61. The Leachate Treatment Facility shall be operational when landfilling commences. The leachate collected from the existing site, the extension area and the two purge wells shall be treated by the leachate treatment facility.
62. RBC capacity shall include provisions for the treatment of contaminated groundwater from the purge well system based on the BOD and ammonia concentrations at monitors M23-3 and M23-4 and a maximum pumping volume of 400 L/min.
63. The following influent criteria shall be used to design the leachate treatment facility:
- 63.1 A maximum leachate volume of 28,000,000 litres per year;
 - 63.2 A design BOD concentration of 3000 mg/L and a first stage loading of less than 31 g/m² day total BOD;
 - 63.3 A design ammonia concentration of 400 mg/L and an ammonia surface loading of no more than 1 g/m² day;
 - 63.4 Design provisions for supplementary heating and future capacity that are acceptable to the Ministry;
 - 63.5 The ability to manage pH and prevent precipitation problems, including design allowances for the easy addition of a pre-treatment system if it becomes necessary; and
 - 63.6 The initial ability to handle a total BOD concentration of 20 mg/L and a flow rate of 400 L/min from the purge well system.

64. The leachate treatment facility shall be designed, operated, maintained and monitored over the contaminating lifespan of the Landfill site to consistently produce an effluent that has:
- 64.1 A maximum BOD concentration of 15 mg/L;
 - 64.2 A maximum summer ammonia concentration of 1.7 mg/L and a maximum winter ammonia concentration of 3.0 mg/L;
 - 64.3 A maximum phosphorus concentration of .03 mg/L; and,
 - 64.4 Water quality that meets or surpasses the requirements of the Provincial Water Quality Objectives and Guidelines.

Waste Placement and Cover material

- 65. The first layer of waste placed on the base of the landfill shall be material that minimizes the potential for geotextile clogging within the leachate collection system.
- 66. Waste shall be deposited in a manner that minimizes the size of the working face and waste shall be compacted before cover material is applied.
- 67. Cover material shall be completely applied by the end of each working day. The average depth of the cover material shall be 15 centimetres to minimize waste exposure and discourage litter and vermin problems.
- 68. Cover material shall be applied so that vertical hydraulic connection is maintained in each cell.
- 69. A contingency supply of cover material for five working days shall be maintained at the site to ensure that adequate cover is always available for application pursuant to Condition 67. This stockpiled cover material shall be located and protected to avoid erosion and sedimentation problems.
- 70. The District Officer shall be notified if an operational problem prevents the timely application of daily cover. The Company shall implement a contingency plan to either cease waste collection, direct wastes to an alternate site or acquire replacement equipment, so that waste is not deposited without daily cover.
- 71. A cover material layer of at least 30 centimetres depth shall be applied in areas where no further waste is to be deposited for 60 days.

- 72. A final cover material layer of at least one (1) metre in depth shall be applied and vegetated in any part of the Landfill area which has reached its approved contour.
- 73. The quality and depth of the final cover material and topsoil shall be suitable for the establishment of vegetation including woody shrubs.
- 74. Cracked or eroded cover material shall be immediately repaired and revegetated to prevent waste exposure.
- 75. Surface ponding of water shall be minimized within or above the active landfill area.

EMPLOYEE AND SUPERVISOR TRAINING

- 76. The Company shall compile a manual to assist landfill personnel in the proper operation and management of the Landfill site and facilities. The manual shall be kept on site at all times. It shall describe the day to day operations of the site and associated facilities and works. A copy of the manual shall be sent to the District Officer and the PLC prior to the commencement of operations.
- 77. The Company shall ensure that all supervisors and all on-site employees receive initial and ongoing training with respect to the following:
 - 77.1 The operating requirements of the Certificate of Approval and the site operations manual identified in Condition 76.
 - 77.2 The permitted hours of operation;
 - 77.3 Relevant operational and management procedures;
 - 77.3 Relevant waste management regulations and legislation;
 - 77.4 Environmental concerns related to the waste being handled at the site;
 - 77.5 Occupational health and safety concerns pertaining to the waste being handled at the site;
 - 77.6 Fire fighting protocol; and
 - 77.7 Emergency contingency measures for preventing off-site impacts.

78. The Company shall prepare detailed plans for the proper operation, monitoring and maintenance of the gas collection and combustion system and the Leachate Treatment Facility. These plans shall be submitted to the Director for approval, prior to the commencement of landfilling. They shall include:
- 78.1 The qualifications and training program required for any personnel operating these systems;
 - 78.2 The regular work schedule for the operation, monitoring and maintenance of these facilities; and
 - 78.3 The provisions for properly trained back-up personnel.

ECOLOGICAL IMPACT CONTROL

79. The fish, wildlife, plants, birds and wetland functions of the Washburn and Storrington wetlands shall be surveyed in May of 1993, prior to the commencement of landfill construction operations;
80. Based on the aforementioned biological surveys and other available information, an Environmental Impact Study shall be prepared pursuant to the Provincial Wetlands Policy and the following minimum requirements shall be met:
- 80.1 The Environmental Impact Study shall include a groundwater and surface water budget. This budget shall be used to design a management plan for stormwater runoff and the effluent from the leachate treatment facility. The plan shall be designed to maintain predevelopment flows to the Washburn wetland, the Storrington Swamp and the discharge stream;
 - 80.2 The results of the Environmental Impact Study shall be submitted to the Ministry, the MNR and the Cataraqui Conservation Authority to determine any additional mitigation measures or design features that would be necessary to prevent the loss of wetland function in the Washburn Wetland; and
 - 80.3 The proponent shall develop a non-intrusive plan for conserving and enhancing the Washburn wetland that would be implemented after the approval of the MNR (eg. enhancing the adjacent property with native trees and shrubs; installing wood duck nesting boxes).

SURFACE WATER IMPACT CONTROL

81. The Environmental Impact Study (EIS) shall be utilized to identify and prevent potential adverse impacts from the construction and operation of sedimentation ponds #1 and #2 adjacent to the Class II Washburn Wetland. The results of this EIS shall be utilized to design a stormwater and sedimentation plan that ensures "no loss of wetland function" pursuant to the Province of Ontario's Wetlands Policy.
82. Based on the results of the Environmental Impact Study the Company shall seek the Ministry's approval for the implementation of the stormwater and sedimentation control plan. The plan shall include the following minimum requirements:
 - 82.1 The stormwater ditch, culvert and sedimentation ponds shall be designed according to the minimum requirements specified in Schedule B1 and B2 to these conditions;
 - 82.2 Any stormwater sedimentation ponds shall be located at least 30 metres from the western boundary of the Washburn Wetland;
 - 82.3 Sedimentation Pond #1 as described in the "Conceptual Design Brief - Storm Water Management Plan - Proposed Storrington Landfill Extension" by Water and Earth Science Associates Ltd., dated September 1992, shall be constructed prior to the commencement of site development;
 - 82.4 Sedimentation fencing shall be placed a minimum of twenty metres from the Washburn Wetland boundary to exclude construction equipment and sediment from the wetland during the construction and vegetation of the sedimentation ponds; and
 - 82.5 The purge wells, the RBC facility and any necessary sedimentation ponds, infiltration trenches or groundwater recharge facilities shall be designed, located and constructed to prevent and/or minimize impact to the Storrington Swamp and discharge stream.
83. In addition to the required Ministry approval under the *OWR Act*, the detailed designs for soil storage, sedimentation fencing, sedimentation ponds and other surface water management proposals shall be submitted to the Cataraqui Region Conservation Authority for approval.
84. Any stockpiled soil shall be enclosed by two sedimentation barriers and shall be located to prevent erosion, minimize sedimentation and protect slope stability.
85. Specialized sedimentation control plans shall be developed and implemented for periods of landfilling operations that are particularly susceptible to erosion and sedimentation (eg. final closure).

86. If the Company cannot construct the sedimentation ponds in the locations described in the aforementioned "Conceptual Design Brief", the Company shall develop and implement a contingency plan that adheres to requirements of these conditions and the Provincial Wetland Policy (eg. no loss of Wetland function).

LANDFILL GAS IMPACT CONTROL

87. The Company shall take all necessary precautions to ensure that methane gas and non-methane organic gases do not present a health hazard to landfill personnel or adjacent property owners.
88. The Company shall design and install an active gas collection and controlled combustion system that is acceptable to the Director. The active gas collection and controlled combustion system shall be operational for the existing refuse area within one year of the issuance of the Board's decision.
89. The active gas collection and controlled combustion system shall be designed, located and landscaped to minimize visual impacts from the surrounding properties and from the Rideau Canal.
90. The active gas collection and controlled combustion system shall be extended into the extension area within six months of any remaining cell being completed to final grade.

REPORTING

Design and Operations Report

91. Prior to the commencement of any Landfill construction activity, the Company shall submit a written design and operations report for approval of the Director. A copy of this Report shall also be provided to the PLC. Once approved by the Director, all actions and programs outlined in the Design and Operations Report shall be followed by the Company. The Report shall reflect the conceptual proposals presented by the Company at the hearing, as modified by the Board's conditions and any subsequent conditions stipulated by the Director. The Design and Operations Report shall include, but not be limited to, the following:
- 91.1 Municipalities served, current waste types and anticipated future quantities and types;
- 91.2 Site capacity, maximum final and base contours;

- 91.3 Method of operation including working areas and cell heights;
- 91.4 Site development stages;
- 91.5 Cover material type, quantities required and quantities available for interim and final use;
- 91.6 Daily and intermediate cover procedures;
- 91.7 Final cover design;
- 91.8 Design of all engineered components (eg. liner, leachate collection system, gas collection system, RBC and tertiary treatment system, and purge wells) and associated monitoring programs;
- 91.9 Establishment and ongoing protection and maintenance of the perimeter buffer zone and tree plantings;
- 91.10 Procedures for mitigation of visual, dust, vector and vermin, litter and odour impacts;
- 91.11 Surface water management, control, and monitoring program;
- 91.12 Site buildings, scales, on-site roads;
- 91.13 Equipment and staffing requirements for the proper operation and maintenance of site equipment and facilities, including training and back-up personnel;
- 91.14 Inclement weather operations and protocol for ceasing landfilling to prevent off-site litter movement during high winds;
- 91.15 Site closure and related activities;
- 91.16 Post-closure maintenance, monitoring and reporting, including costs of closure and repairs;
- 91.17 Summary of contingency plans for groundwater, surface water, and leachate control;
- 91.18 Trigger mechanisms which will be used to determine whether the contingency plan is to be implemented; and

- 91.19 A description of soil stockpile activities, including use, timing, locations, erosion protection, affect on slope stability near the storage area (eg. existing landfill slopes) and temporary sediment containment and vegetation measures.

Hydrogeological Report

92. A written hydrogeological report shall be submitted to the Director for approval and two copies shall be provided to the PLC. The report shall include, but not be limited to, the following:
- 92.1 A site plan outlining all ground water monitoring locations;
 - 92.2 A detailed monitoring program;
 - 92.3 A table outlining monitor location, analytical parameters sampled for and frequency of sampling;
 - 92.4 Discussion, interpretation, conclusions and recommendations regarding all geochemical data obtained to date. Geochemical data will be appended to this report;
 - 92.5 Discussion of ground water parameters and compliance with the Reasonable Use Policy at the property boundary;
 - 92.6 Contingency plans; and
 - 92.7 Trigger levels used to implement contingency plans.
93. Commencement of any activity in the extension area shall not occur prior to receipt of approval of the hydrogeological report by the Director. Once approved, all actions and programs outlined therein shall be followed by the Company.

Annual Report

94. The Company shall submit an annual report to the Director, the Regional Director, and the PLC by November 30 of each year, commencing November 1, 1994. This Annual Report shall cover the preceding 12 month period and shall contain the following information:
- 94.1 A site plan outlining all groundwater surface water and gas monitoring locations;
 - 94.2 A table outlining monitor location, analytical parameters sampled and frequency of sampling;

- 94.3 A discussion and interpretation of the monitoring data; a review of the adequacy of the monitoring program; conclusions on the monitoring data; and recommendations for any changes that may be necessary. Complete monitoring data shall be appended to the annual report;
- 94.4 A discussion of groundwater parameters in relationship to compliance with the Reasonable Use Policy at the property boundaries and the trigger for the installation of additional purge wells;
- 94.5 A discussion of surface water monitoring data with respect to the prevailing Provincial Water Quality Objectives and Guidelines;
- 94.6 A groundwater flow and contaminant migration trend analyses including updated mapping of plume concentrations;
- 94.7 A summary of all waste received at the site in terms of weight and municipality of origin; a list of all current institutional, commercial and industrial users; and a list of all vehicles refused entry to the site and the reasons for refusal.
- 94.8 A description of any environmental problems encountered during the operation of the site and any preventative and mitigative actions taken;
- 94.9 A summary of changes in operations, equipment or procedures made or proposed at the site and any operating difficulties encountered;
- 94.10 The results of all routine inspections of the leachate containment, collection and treatment facilities;
- 94.11 An assessment of the operation and performance of all leachate containment, collection and treatment facilities;
- 94.12 A discussion of any difficulties in meeting operational objectives and plans to address and remedy these problems;
- 94.13 Site-related meteorological data including daily temperatures, precipitation, windspeed and potential evapotranspiration rates;
- 94.14 Contour maps showing current landfill contours, maximum final landfill contours, percentage of available space utilized and an estimate of the remaining site capacity and life; and

- 94.15 A description of Laidlaw's activities pertaining to waste reduction, recycling and the diversion of potentially problematic substances (eg. old batteries, used paint tins) from the waste stream.

Operational Reporting

95. The Company shall install a weather station on the site and record daily measurements of wind speed and direction, maximum and minimum temperatures, barometric pressure and precipitation.
96. Daily records shall be maintained at the site, including:
- 96.1 All complaints from the public received by the Company and an indication of the action and timing of the response by the Company;
 - 96.2 The results of any tests done to determine the acceptability of waste at the site;
 - 96.3 The total quantity (tonnage) of waste received at the Landfill each day;
 - 96.4 A reference to the origin of the waste and the hauler delivering the waste; and
 - 96.5 Brief confirmation of any prescribed monitoring, maintenance and operation of the Landfill facilities that was accomplished (eg. a checklist).
97. A tonnage summary shall be provided to the District Officer quarterly. The Report shall contain a breakdown of tonnage by serviced municipality for the preceding three calendar months. The report shall list all vehicles that were refused entry to the site and the reasons for refusal.

MONITORING

Groundwater Monitoring

98. Two additional groundwater monitors shall be drilled, one to the east of the existing site and north of the East Pond; the other along the southwest property boundary. The preferred location of these additional monitors shall be chosen by the PLC.
99. The groundwater parameters to be sampled and the schedule for groundwater sampling shall follow the summary of groundwater monitoring presented in Schedule C to these Conditions.

100. If a groundwater monitor ceases to function, it shall be repaired or replaced with a properly functioning monitor as soon as possible.

Surface Water Monitoring

101. Surface water quantity and quality shall be monitored at the inlet and outflow of the sedimentation ponds by measuring flow rate, total suspended solids (TSS), phosphorus (P), dissolved oxygen, ammonia, and temperature. Sampling shall be conducted at least twice a month during the opening and closing years of the Landfill. Sampling shall occur during significant discharges after storm events.
102. Surface water quantity and quality shall be monitored at the 90 metre and 450 metre locations in the discharge stream for: flow rate; total suspended solids (TSS); phosphorus (P); Biological Oxygen Demand (BOD); dissolved oxygen; ammonia; and temperature. Sampling shall be conducted at least twice a month, once during a wet period and once during a dry period.
103. Additional surface water monitoring shall be conducted at the 450 metre location of the discharge stream at least every other month for at least one year. This additional monitoring shall analyze the surface water for trace organics (eg. benzene, toluene, trichloroethylene, diethyl ether) and heavy metals.
104. After considering the data collected over the first year and after consulting with the PLC, the Director shall stipulate an ongoing schedule for surface water monitoring.
105. The monitoring program for the RBC effluent shall include appropriate sampling for the following parameters: flow rate, temperature, ammonia, BOD, phenols, dissolved oxygen, phosphorus, TSS, aluminum, cadmium, copper, cyanide, chromium, mercury and lead.
106. The Director, after consulting with the PLC, shall stipulate a monitoring schedule and protocol for the effluent from the Leachate Treatment Facility to ensure compliance with the effluent criteria established by the Board's Decision (i.e. the Provincial Water Quality Objectives and Guidelines).

Landfill Gas Monitoring

107. Monitoring of landfill gases at the Landfill site shall consist of the following:
 - 107.1 Nested probes in the buffer area around the perimeter of the Landfill and within the refuse mounds. The spacing and distribution of the nested probes shall be acceptable to the Director; and

- 107.2 The probes shall be regularly tested for combustible gas content, gas pressure, temperature, water level and volatile organic compounds, on a schedule that is acceptable to the Director.

Residential Well Monitoring

108. The Company shall conduct semi-annual analyses of well water quality, upon request, by any resident living along the Washburn Road within 800 metres of the Landfill;
- 108.1 The analyses shall sample for conductivity, chloride, iron, alkalinity, BOD, COD, benzene, toluene, xylenes, ethylbenzene, and diethyl ether;
- 108.2 The results of the analyses shall be provided to the residents with a simple interpretation that includes reference to the Ontario Drinking Water Quality Objectives or Guidelines;
- 108.3 The results of the analyses will be provided in the most timely manner possible;
- 108.4 If the well water has become contaminated by substances known to be present in landfill leachate, then an independent consultant shall be retained by the PLC (at the Company's expense) to review and confirm the sampling results. A more comprehensive scan shall be carried out to determine the presence or absence of leachate impacts from the landfill; and
- 108.5 If the consultant concludes that contamination by landfill leachate has occurred, then the Company shall immediately provide an alternate supply of water at the Company's expense. This alternate safe water supply shall be maintained until an alternate water supply of good quantity and quality can be re-established.

Ecosystem Health Monitoring

109. The 1993 spring biological survey of fish, wildlife, plants and birds in the vicinity of Washburn Wetland and Storrington Swamp shall be supplemented by surveys in the summer and fall of 1993. Additional biological surveys shall be conducted on a yearly basis each spring until three years after the landfill closes;
110. At least two vertebrate "indicator" species (eg. a disturbance sensitive fish and a bird) shall be surveyed on a regular yearly basis from 1993 until at least the year 2003 to evaluate population levels in the Washburn Wetland and the Storrington Swamp and stream.

111. Algae populations and sedimentation must be sampled quantitatively at approximately the 450 metre downstream section of the discharge spring and the outlet of the East Pond into the Washburn wetland. This sampling shall occur during June and August of 1993 and each June and August thereafter until the end of the landfill's contaminating lifespan;
112. Beginning in May of 1993, and each spring thereafter for at least ten years, studies shall be conducted to examine potential bioaccumulation and biocentration of contaminants at the 450 metre point in the discharge stream and in the Washburn Wetland near the outlet of the East Pond. For example, freshwater clams and leeches could be placed in under-water cages and after exposure to the local water conditions for several weeks these organisms could be analyzed for potential bioaccumulation of landfill contaminants.
113. The results of the aforementioned surveys and sampling shall be contained in the Annual Report for the Landfill. Copies of the Report shall be provided to the MOE Director, the MNR District Office, the Cataraqui Conservation Authority, the PLC; and the Storrington Township Library.

CLOSURE PLANS

114. At least two years prior to site closure, the Company shall submit a complete plan to the Regional Director outlining post-closure maintenance and monitoring. The plan shall include:
 - 114.1 Fencing and access control;
 - 114.2 Details of any additional cover;
 - 114.3 Details of additional vegetative plantings;
 - 114.4 Post-closure land-use plans;
 - 114.5 Plans and schedules for continued operation, maintenance and monitoring of the leachate containment, collection and treatment systems;
 - 114.6 Plans and schedules for the continued monitoring of surface water, groundwater and gas;
 - 114.7 Plans and schedules for the routine operation, maintenance and monitoring of the active gas collection and combustion system;
 - 114.8 Plans and schedules for the routine operation, maintenance and monitoring of the purge wells and any groundwater recharge system;

- 114.9 Plans and schedules for the routine monitoring and maintenance of the surface water drainage ditches and sedimentation ponds; and
- 114.10 Updated contingency plans to mitigate impacts from leachate, stormwater or gas.
- 115. The Landfill site and the Company's buffer lands to the east and the south, shall not be transferred or encumbered unless:
 - 115.1 The Director is notified in writing;
 - 115.2 The Director is satisfied that the Conditions of Approval of this Certificate will not be violated; and
 - 115.3 Additional financial assurances are provided, if requested by the Director, to ensure the implementation of these conditions.

FINANCIAL ASSURANCE - GENERAL

- 116. A financial assurance plan shall be submitted to the Director within 60 days of the issuance of the Certificate of Approval. Financial assurance shall be provided for the following:
 - 116.1 Long term surface water, groundwater and gas monitoring programs;
 - 116.2 Maintenance and monitoring of the leachate containment and collection system;
 - 116.3 Operation, maintenance and monitoring of the leachate treatment facilities (eg. Rotary Biological Contactor, tertiary treatment facility);
 - 116.4 Operation, maintenance and monitoring of the surface water drainage system and sedimentation ponds; and
 - 116.5 Implementation, operation and maintenance of the purge wells and any groundwater recharge system.
 - 116.6 Implementation, operation, maintenance and monitoring of the gas collection and combustion system.
- 117. The financial assurance shall be:
 - 117.1 An amount that is satisfactory to the Director;

- 117.2 Secured by the Company through a commercial irrevocable letter of credit from a Chartered Bank or other financial institution that is satisfactory to the Director or a cash deposit to the Consolidated Revenue Fund of the Province of Ontario;
- 117.3 Payable to the Crown;
- 117.4 Maintained until the Director is satisfied that the fund is no longer required;
- 117.5 Adjusted annually based on the Statistics Canada Construction Building Material Price Index;
- 117.6 Accessible to the authorized representatives of the Crown for the purposes of refurbishing potable water supplies if leachate from the Landfill site renders any residential water supply unusable;
- 117.7 Accessible to the authorized representatives of the Crown for the purposes of funding rehabilitation or improvements to the Landfill site that may be undertaken by the Crown;
- 117.8 Automatically extended for one year from the expiration date, unless sixty days prior to such date the approved financial organization notifies the Director by registered mail that the letter of credit will not be renewed; and
- 117.9 Available to be drawn upon by the Director prior to the letter of credit being revoked or not renewed.

FINANCIAL ASSURANCE - POST CLOSURE

- 118. At least one (1) month prior to site closure, the Company shall provide a post-closure trust fund in an amount satisfactory to, and controlled by, the Director.
- 119. The trust fund shall contain sufficient funds for operating, monitoring and maintaining the following pollution abatement facilities over a contaminating lifespan of at least fifty years:
 - 119.1 Leachate containment, collection and treatment facilities (eg. leachate collection system, sump pumps, necessary RBC capacity and the tertiary treatment facility;
 - 119.2 Monitoring programs for groundwater, surface water, landfill gas and ecological health;
 - 119.3 Purge wells and any groundwater recharge systems;
 - 119.4 Active gas collection and combustion systems;

- 119.5 Surface water drainage ditches and sedimentation ponds;
- 119.6 Landfill cover and vegetation;
- 119.7 Refurbishing potable water supplies if leachate from the Landfill site renders any residential water supply unusable; and
- 119.8 Any other provisions that the Director deems prudent for the long term protection of the environment in the vicinity of the site.

MISCELLANEOUS

- 120. The terms and conditions of this Certificate of Approval replace all previous terms and conditions of Certificate of Approval No. A 381502.
- 121. If the Director or Regional Director identify an unacceptable environmental impact associated with the Landfill site, the Company shall immediately take all necessary steps to implement contingency plans to remedy the problem.
- 122. The requirements of the Certificate of Approval are severable. If specific requirements of the Certificate of Approval are determined to be invalid, the other conditions of the Certificate of Approval shall still apply.
- 123. The Company shall grant provincial officers full access to the Landfill site and its facilities to carry out any inspections pursuant to the *EP Act*, the *OWR Act*, the *Pesticides Act* and any other relevant legislation.
- 124. The requirements specified in the Certificate of Approval are minimum requirements that do not reduce the responsibility of the Company to take all reasonable steps to comply with all applicable legislation.
- 125. This Conditions of Approval shall be registered on the title for the Landfill site property within 60 days of the issuance of a Provisional Certificate of Approval. A registered copy of the relevant documentation shall be immediately submitted to the Director.
- 126. Within 60 days of the issuance of a Provisional Certificate of Approval, a description of the location of the existing leachate plume shall be registered on the title to the lands that are contaminated by the plume.
- 127. All financial liabilities that are associated with the development, operation, closure and post-closure care of the Landfill site are binding on the Company.

Schedule A - Condition 41

The following is a list of Eligible Property Owners to whom Laidlaw's Compensation Policies apply:

<u>NAME</u>	<u>ACRES</u>	<u>ASSESSMENT ROLL NUMBER</u>
1. S. Aldridge	1.0	1-040-7310
2. D. & M. Campbell	34.6	1-040-06240 (Conc. 7)
3. D. & M. Campbell	3.6	1-040-7120
4. B. & J. Estabrooks	1.0	1-040-066
5. Harrison Sand & Gravel	98.2	1-040-065 (*)
6. R. & J. Heaney	18.8	1-040-073 (North)
7. R. & J. Heaney	26.2	1-040-073 (South)
8. L. & M. Lubimiv	0.8	1-040-6510
9. L. & M. Mundell	5.0	1-040-072
10. C. & D. Preston	1.0	1-040-7110
11. D. & B. Smith	4.0	1-040-05930
12. F. & A. Sonneveld	16.8	1-040-062 (Conc. 7)
13. R. & D. Dusharme	2.0	1-040-5910
14. L. & E. Kelly	1.29	1-040-5920
15. M. Dark	1.24	1-040-5921
16. C. & J. Fletcher	66.5	1-030-093

(*) Odours only as long as the site is operating as a sand and gravel pit.

Schedule B1 - Minimum Stormwater Pond Design Requirements - Condition 82

The stormwater and sedimentation control ponds shall be designed to:

- prevent downgradient erosion and water quality problems by reproducing ecological features that naturally regulate flow and enhance water quality;
- accommodate a 1 in 100 year storm and an additional twenty percent contingency volume to reduce the required frequency of maintenance;
- minimize impacts to existing vegetation and wildlife communities by appropriate location, timing and containment of construction activities;
- retain a residual water level that can support cattails and wetland vegetation and create a small central island that is suitable for waterfowl nesting;
- contain at least two cells per pond to improve contaminant removal and to protect the ecological functioning and vegetation in one cell when the other cell requires maintenance;
- ensure the planting of woody wetland vegetation (eg: willows, red osier dogwood) around the perimeter;
- ensure the planting of clumps of native trees on the north side of the pond to provide adjacent shelter and habitat (eg: white cedar, white pine, swamp white oak);
- accommodate necessary maintenance with minimal damage to growing vegetation and exclude livestock from the pond area and the planted areas;
- agitate the water as it enters and leaves the pond to increase aeration;
- facilitate graduated and partitioned outflow that approximates predevelopment flow patterns and volumes (eg: V notch overflow pipe, partitioning of outflow into existing drainage swails);
- minimize the ditching required to partition the pond outflows;
- favour the use of locally produced natural materials (eg. stone, wood, gravel, vegetation);
- discharge into infiltration trenches, if needed, to mimic predevelopment flows or recharge groundwater; and,
- provide a secure (lockable) control that can stop outflow for temporary isolation and storage of contaminated runoff pending treatment.

Schedule B2 - Condition 82**Minimum Stormwater Ditch and Culvert Design Requirements**

The stormwater ditches and culverts shall be designed to:

- prevent downgradient erosion and water quality problems by reproducing ecological features that naturally regulate flow and enhance water quality;
- accommodate a 1 in 100 year storm event and an additional twenty percent contingency capacity to reduce the required frequency of maintenance;
- ensure the planting and survival of native marsh vegetation (eg: cattails) in the bottom of the ditches;
- ensure the planting and maintenance of native shrubs (eg: red osier dogwood, willow, staghorn sumac) along the ditch slopes to provide soil stabilization, uptake of water and nutrients and other desirable ecological functions;
- provide for the planting of woody shrubs amongst the rip rap lining, if it is used;
- ensure the ditches have irregular bends and curves along their length to maximize channel capacity for a given length;
- require check dams at 20 metre intervals to increase turbulent aeration and to reduce velocity and suspended sediment loads in rip rap sections;
- favour the use of locally produced natural materials (eg. stone, wood, gravel, vegetation);
- accommodate necessary maintenance without excessive damage to established vegetation; and,
- consider the value of lockable quick-closing sluice gates at strategic locations to permit the temporary isolation and storage of contaminated runoff pending treatment.

SCHEDULE C: Groundwater Monitoring Program

LOCATION	WELL	FREQUENCY	PARAMETERS
Northern Boundary	M22	Annual	L.I.L.
Western Boundary	M18(*), M15, M14(*), M11, [M31]	Biannual	L.I.L.
	M9	Annual	Cl, Cond
Southern Boundary	M19, M29, M28, M26, M27	Biannual	L.I.L.
Eastern Boundary	2S, 2D, 3S, 3D, M8-1, M8-3, M25, M30, [M32]	Biannual	L.I.L.
	M5, M7-1, -2, M7-3	Annual	L.I.L.
	M8-2	Annual	Cl, Cond
Other	M23, M24	Biannual	L.I.L. & heavy metals
	M12, M13	Annual	L.I.L.
Existing leachate Sump		Biannual	L.I.L. & heavy metals
Expansion leachate Sump		Biannual	L.I.L. & heavy metals

(*) Well to be reconstructed prior to site reopening

L.I.L. Leachate Indicator List to include the following: Chloride, alkalinity, conductivity, BOD, COD, iron, benzene, toluene, ethylbenzene, xylene, Diethyl Ether.

[M31] [M32] Wells to be installed between M9 and M11, and between M22 and M5, after consultation with the PLC and the Ministry.

heavy metals Cadmium, chromium, nickel, lead, silver, mercury, aluminum.

Appendix B

Summary of the EA Act

Section 2 of the EA Act describes the purpose of the Act as follows:

The purpose of this Act is to promote the purpose of the environment and to ensure that the environment is protected and improved, and to ensure that the environment is protected and improved.

Section 3 of the EA Act states that the purpose of the environment is to ensure that the environment is protected and improved, and to ensure that the environment is protected and improved.

The purpose of the environment is to ensure that the environment is protected and improved, and to ensure that the environment is protected and improved.

(a) a description of the purpose of the environment;

(b) a description of the purpose of the environment;

(c) a description of the purpose of the environment;

(d) a description of the purpose of the environment;

(e) a description of the purpose of the environment;

PART VI - APPENDICES TO THE BOARD'S DECISION

(1) The purpose of the environment is to ensure that the environment is protected and improved, and to ensure that the environment is protected and improved.

(2) The purpose of the environment is to ensure that the environment is protected and improved, and to ensure that the environment is protected and improved.

(3) The purpose of the environment is to ensure that the environment is protected and improved, and to ensure that the environment is protected and improved.

(4) The purpose of the environment is to ensure that the environment is protected and improved, and to ensure that the environment is protected and improved.

(5) The purpose of the environment is to ensure that the environment is protected and improved, and to ensure that the environment is protected and improved.

Appendix A

Synopsis of the EA Act

Section 2 of the *EA Act* describes the purpose of the Act as follows:

The purpose of this Act is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment.

Sub-section 5(3) of the *EA Act* outlines the rational Environmental Assessment planning process;

An environmental assessment submitted to the Minister pursuant to subsection (1) shall consist of

- (a) a description of the purpose of the undertaking;
- (b) a description of and a statement of the rationale for,
 - (i) the undertaking,
 - (ii) the alternative methods of carrying out the undertaking, and
 - (iii) the alternatives to the undertaking;
- (c) a description of,
 - (i) the environment that will be affected or that might reasonably be expected to be affected, directly or indirectly,
 - (ii) the effects that will be caused or that might reasonably be expected to be caused to the environment, and
 - (iii) the actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects that might reasonably be expected upon the environment,by the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking; and
- (d) an evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking.

Appendix B - Public Hearing Process

The EA Board received the necessary *EA Act* referral from the MOE and the Minister on September 3, 1991 and a preliminary hearing was scheduled. The Board required the proponent to deliver a Notice of Hearing to the EA participants and the residents near the Storrington site. A public Notice of Hearing was also published in the Kingston Whig Standard.

The preliminary hearing was held on December 16, 1991 in the Township of Storrington Municipal Offices near Sunbury. Party and intervenor status was granted to eligible interests, the central hearing issues were identified, and hearing procedures and scheduling were discussed. After the preliminary hearing the Board issued directions for: consideration of intervenor funding applications; exchange of information and consultation between the various parties; and specific steps necessary to prepare for the main hearing.

The eligible parties were given a period to prepare and submit applications for intervenor funding after the preliminary hearing and an intervenor funding hearing was held on January 31, 1992. A separate panel of the EA Board (the funding panel) awarded intervenor funding to SCAT and the Township of Storrington to support their participation in the hearing.

A local resident, Ms. G. Dixon, raised the issue of a Storrington Township bylaw (1978-15 as amended by 1986-17) at the preliminary hearing. Subsequent to the preliminary hearing the proponent requested and received the Minister's referral of this matter to the EA Board for a public hearing. Pursuant to s. 36 of the *EP Act*, the Minister directed the Board to consider whether the bylaw should apply to the proposed Storrington Landfill extension.

After the parties had consulted and exchanged information, a pre-hearing conference was held on May 29, 1992. The prehearing conference was held by a member of the EA Board who was not on the main hearing panel. The discussions in this conference were not disclosed to the hearing panel. However, the parties agreed that a brief written conclusion could be provided to the hearing panel.

The actual hearing panel conducted two additional preliminary hearings to deal with preliminary motions and issues of Notice regarding the Minister's referral on Storrington Township bylaw 1978-15. A supplementary Notice was issued regarding the bylaw issue to ensure that all potentially interested persons were properly notified of the consideration of the bylaw matter as a part of the EA hearing.

The main hearing commenced on June 28, 1992. The usual hours of the hearing were Monday and Wednesday 1:00 pm to 9:00 pm and Tuesday and Thursday 9:30 to 5:30 pm. The evening hours facilitated regular public access to the hearing. Several members of the public regularly attended these evening hearing sessions and occasionally more than two dozen residents were in attendance.

All the hearing parties, except Mr. Angus Bruce and Ms. Gayle Dixon, were represented by legal counsel. SCAT and Storrington Township had received intervenor funding to facilitate their participation in the hearing. Mr. Bruce, Ms. Dixon and SCAT opposed the proposed Landfill extension. The MOE, Kingston Township and the City of Kingston supported the Landfill extension, if the design and operation of the facility could minimize impacts to the local community and the natural environment.

The proponent was very well represented by its counsel, Mr. Smithemann and Mr. Zimmer, and a case manager, Ms. Lemieux. They advanced their client's interests in a reasonable and effective manner. Their responsiveness to the suggestions of the Board resulted in a more efficient hearing process.

The benefits of Intervenor Funding were evident. Counsel for SCAT thoroughly scrutinized the EA process and SCAT's technical consultant's provided a valuable critical perspective of the undertaking. SCAT's counsel ably represented the interests of the local community and other broad public and ecological interests. The intervention of SCAT assisted the Board in its decision-making functions.

The MOE counsel and the MOE experts were very helpful to the Board. The Social Impact evidence of Andrew McAllister, the gaseous emissions evidence of Scott Grant, the wastewater treatment evidence of Dr. Manoharan and the hydrogeological evidence of Mr. Kaye were particularly helpful to the Board's appreciation of these complex technical matters. The Government Review contained a thorough analyses of the strengths and weaknesses of the

proponent's EA process. However, the participation of the government agencies during the EA presubmission consultation process does not appear to have proactively represented important public and ecological interests.

For example: the MNR failed to provide sufficient direction and input regarding the protection of the fish and wildlife habitat of the Washburn Wetland; the MOE failed to provide sufficient information and assistance to the public and the proponent during the EA presubmission phase; the EA Branch failed to require the circulation of EA drafts 3 and 4 to the EA participants; and the Cataraqui Conservation Authority and the MOE failed to require better surface water management and sedimentation control for the existing and proposed sites. The failure to proactively address these and many other issues prior to the hearing resulted in a more contentious and lengthy hearing. It also contributed to the complexity and length of the Board's decision-making process and the eventual decision.

The contributions of Mr. Bruce and Ms. Dixon helped to bring forward important information and valuable perspectives. Mr. Bruce attended the hearing on a regular basis without remuneration. The Board was impressed with his long term knowledge of the site, his practical engineering and environmental insight, and his common sense.

The City of Kingston and Counsel for the Township were represented by separate counsel. Both counsel attended the hearing regularly during the preliminary phase of the hearing. They introduced evidence on the need for interim disposal capacity pending the completion of the Kingston Waste Management Master Plan (KWMMMP) and the development of a shared municipal disposal site.

The City and the Township did not have the expertise or funding to scrutinize the technical aspects of the proposal. However, both the City and the Township expressed a strong interest in the development of a Storrington extension that would properly address environmental and community concerns. They delegated this responsibility to the MOE and the hearing process. Once the evidence on the KWMMMP and need was presented, the City and Township of Kingston maintained a watching brief. Counsel attended from time to time to address an issue that was relevant to their client's interests. The selective participation of the Township and the City was helpful to the hearing process.

The Township of Storrington also received intervenor funding. It was ably represented by experienced legal counsel throughout the hearing. Storrington Township was originally in opposition to the undertaking. However, a potentially lucrative Host Municipality Agreement was negotiated with the proponent during the preliminary phase of the hearing. Counsel for Storrington announced the withdrawal of Storrington's opposition just before a crucial motion was to be heard. The motion by SCAT urged the rejection of the Storrington extension on the basis that the proponent's EA process failed to satisfy the requirements of the *EA Act*. After the Host Municipality Agreement was reached, the contribution of the Township's counsel was less significant.

Environment Canada was also represented by counsel, primarily during the initial and closing few days of the hearing. The protection of the Rideau Canal's recreational, historic and ecological values was furthered through the participation of Environment Canada.

Some of the factors that contributed to the length of the hearing were: the significant revisions to the undertaking during the course of the hearing (eg. deletion of leachate recirculation, revision of leachate and surface water management); the failure of the responsible government agencies to thoroughly address environmental and social issues prior to the hearing (eg. stormwater management, delineation of the existing leachate plume); difficulties in scheduling expert witnesses during the summer; the requirement for additional groundwater sampling; the time required for cross examination by the several parties; and the weaknesses in the proponent's EA documentation and planning.

The main hearing was completed in approximately 67 hearing days, including the several site visits. There were approximately 80 witnesses and 249 Exhibits. The hearing was completed on Friday November 20, 1992.

Site Visits

The Board made several site visits during the hearing. Most of the site visits took place during unavoidable pauses in the hearing. All the parties were invited to attend the site visits and local residents were also welcome. The proponent's counsel, SCAT's counsel, the MOE's counsel, Mr. Bruce, Storrington Township's counsel and members of the community, were present on many of the site visits.

The first visit to the Storrington Landfill was arranged a few days into the main hearing. It familiarized the Board with the physical setting of the Storrington landfill site, including the adjacent rural community and the nearby Rideau Canal and Washburn Locks.

The second site visit involved a half day "trek" around the surrounding buffer lands, including the provincially significant Washburn wetland to the east and the Storrington swamp to the south. This visit familiarized the Board with the natural environment surrounding the site and the monitoring locations.

The second site visit allowed the Board to view: the surface water drainage patterns in the vicinity of the site; the recently established groundwater and surface water monitoring locations south of the Washburn Road; the well drilling rig; the groundwater discharge area and springs; the small stream and the proposed Marsh Treatment System; the adjacent farm properties; and the proposed locations for leachate and stormwater treatment facilities. Dr. Creasy explained well drilling and monitoring techniques during this site visit.

The nearby residences along Washburn Road were also visited. The residents were very hospitable and appreciative of the Board's interest in their perspective. The Board invited the local residents to attend the hearing to express their concerns on the record. Many of the residents did testify at subsequent public evening sessions.

The Board visited the Richmond Landfill on short notice. This visit allowed the Board to observe: an operational Laidlaw landfill; the general characteristics of a site that was compared with the Storrington site during the EA; and the results of Laidlaw's operational methods for controlling off-site impacts (eg. noise).

The Britannia Landfill site in Peel (Toronto) was visited to observe an operational Rotary Biological Contactor (RBC). This technology was proposed for leachate treatment at the Storrington site. Some tree plantings on the Britannia site were also visually surveyed to determine species hardiness in a landfill area.

Near the end of the hearing, the Board walked around the perimeter of the existing site and the proposed extension area. This final site visit permitted the Board to: observe the visual sight lines to adjacent residences after leaf fall; clarify the spatial orientation of the proposed facilities; observe the soil and bedrock characteristics in various areas of the existing site and the proposed extension; and experience the general environmental conditions in the vicinity of the landfill.

Appendix C

EA Summary of Landfill Use

Landfill	Service Area		Capacity	Annual Use	Tipping Fee
Trail Road	RMOC	*	850,000 tonnes	200,000	\$66/tonne
Rump	Unlimited		3,000,000 tonnes	226,000	\$70/tonne
Cornwall	Cornwall	*	2,100,000 tonnes	80,000	\$15/tonne
Richmond	Unlimited		1,000,000 tonnes	80,000	\$39/tonne
Storrington	Kingston area		980,000 tonnes	80,000	\$39/tonne

* approximated tonnage converted from cubic metres using 700 kg/m³

RMOC - Region of Ottawa Carleton

Appendix D

Land Use Chronology

- December, 1971 - North half of landfill site (i.e., those lands accommodating the existing landfill operation) purchased for waste disposal purposes.
- September 9, 1975 - Storrington Official Plan adopted by Council. Landfill site (north and south half) designated "Rural" which provides for the establishment of waste disposal uses in accordance with various planning policies.
- November 22, 1976 - Official Plan approved by Minister of Housing.
- November 3, 1978 - Storrington comprehensive Zoning By-law No. 1978-15 passed by Council. Existing landfill site zoned "Rural (A)".
- November 5, 1979 - By-law 1978-15 given temporary approval by OMB.
- 1978/1979 - South half of landfill site (i.e., those lands proposed to accommodate the expanded landfill operation) purchased for waste disposal purposes.
- June 6, 1979 - By-law No. 1979-18 passed by Council zoning south half of landfill site "Solid Waste Disposal (G)". "G" zone permits a landfill site subject to various zoning criteria.
- March 14, 1980 - By-law 1979-18 approved by OMB after a hearing.
- March 24, 1981 - OPA 6 adopted by Council designating north and south halves of landfill site "Rural (Solid Waste Disposal Sites).
- March 24, 1982 - OPA 6 approved by Minister of Municipal Affairs and Housing.
- February 16, 1983 - Council passes Landfill Regulatory By-law No. 1983-9 governing the operation and establishment of landfill sites, pursuant to the Municipal Act.
- July 1, 1984 - Storrington designated under the Pits and Quarries Control Act.

Appendix D - Land Use Chronology (contd.)

- November 27, 1984 - Lands south of Washburn Road purchased by landfill operator.
- August 18, 1986 - By-law No. 1986-17 (updating By-law 1978-15) passed by Council zoning landfill site "Special Rural Disposal (SRD)".
- October, 1986 - Additional lands to the south of Washburn Road purchased by landfill operator.
- November 28, 1986 - MNR issues "Pit" license to Barmin Inc., on part of Lots 17 and 18, Concession 7.
- March 3, 1987 - By-law 1978-15 as amended received final approval from the Ontario Municipal Board.
- February 22, 1988 - OPA 17 adopted by Council providing for the location of a leachate treatment system to the south of Washburn Road.
- February 22, 1988 - By-law No. 1988-16 passed by Council providing for location of a leachate treatment system to the south of Washburn Road.
- May 17, 1988 - OPA 17 approved by the Minister of Municipal Affairs.
- March 6, 1989 - OPA 19 (dealing with the Dog Lake estate residential subdivision) adopted by Council.
- April 4, 1989 - OPA 19 approved by Minister of Municipal Affairs.
- June 21, 1989 - Additional lands to the south of Washburn Road and east of the Johnson sideroad purchased by landfill operator.
- November 20, 1989 - By-law No. 1989-54 (dealing with the Dog Lake estate residential subdivision) passed by Council.
- May 11, 1990 - MNR renews Barmin "Pit" license on part of Lots 17 and 18, Concession 7, pursuant to the Aggregate Resources Act.
- November 6, 1990 - Storrington Council repeals the old Official Plan and adopts a new Official Plan of the Township of Storrington. The new plan designates the north and south halves of the landfill site as "Waste Disposal".

Appendix E - Darcy's Law

Hydrogeologists use Darcy's Law to predict groundwater flow based on the measurements obtained from groundwater monitors. Darcy's Law states that groundwater movement is dependent on three variables: hydraulic conductivity "k"; hydraulic gradient "i"; and the porosity "n" of the geologic material. Groundwater flow rate ("q" in meters per second) is calculated by Darcy's Law as follows:

$$q = \frac{K \times i}{n}$$

where

K	is hydraulic conductivity (m/s)
i	is hydraulic gradient (m/m)
n	is porosity (or pore space) of the deposit

Hydraulic conductivity "K" is a measure of a geologic materials ability to transmit water. For example: clay has a very low hydraulic conductivity and therefore water can only move very slowly through clay; gravel has a very high hydraulic conductivity and therefore water can move very quickly through gravel. Porosity "n" is a measure of the pore space within a geologic material. Hydraulic gradient "i" is a measure of the difference in the hydraulic head between two points divided by the distance between those points.

The hydraulic gradient of an unconfined aquifer is the slope of the water table between two points. The steeper the slope, the greater the potential for groundwater flow. Groundwater will always move from areas of higher hydraulic head (upslope) to areas of lower hydraulic head (downslope). However, the actual movement of groundwater requires a pathway and the pathway is dependent on the porosity and hydraulic conductivity of the geological materials between the upslope and downslope points.

A surface water analogy illustrates the difference between potential and actual flow. Water normally flows downhill. However, if a drainage ditch traverses the hill slope at an angle, water will follow the ditch at an angle down the slope. The groundwater analogy for the surface ditch would be a subsurface deposit with a high hydraulic conductivity (eg. gravel) traversing the slope of the water table at an angle.

Appendix F

Calculating "Reasonable Use" Contaminant Concentrations

The Reasonable Use Policy (RUP) uses the following equation to calculate the maximum acceptable concentration "Cm" of a chemical in groundwater at the property boundary of a landfill:

$$C_m = C_b + (f \times (C_r - C_b))$$

where C_b = the background concentration of the chemical,

C_r = the ODWO limit for the chemical,

f = a factor of 0.25 for health related parameters, or a factor of 0.5 for aesthetic parameters

The Ontario Drinking Water Objectives (ODWO) are contained in a publication entitled *Water Management - Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment (MOE, 1984)*. This publication is often referred to as the "Blue Book". The ODWO limit for chloride (an aesthetic parameter) is 250 mg/L. The background level (C_b) of chloride in the natural groundwater is approximately 10 mg/L. Therefore, the Reasonable Use limit at the property boundary is:

$$\begin{aligned} G_m &= (10) + 0.5 * (250 - 10) \\ &= 10 + 120 \\ &= 130 \text{ mg/L} \end{aligned}$$

Appendix G

COMPENSATION POLICIES

FOR

THE STORRINGTON LANDFILL

OWNED AND OPERATED BY

LAIDLAW WASTE SYSTEMS (STORRINGTON) LTD.

I POTENTIAL IMPACT AREA DEFINED

The Potential Impact Area is defined as that area surrounding the landfill working face (exclusive of the buffer area) where noise, air quality and visual impacts may periodically occur and intrude on a property owner's or resident's personal use and enjoyment of the property. For the noise and air quality (i.e. dust) criteria, the Potential Impact Area is defined by where these effects could periodically attain or exceed the provincial criteria. As for visual impact, the Potential Impact Area is determined by periodic substantial visual impact.

For the Storrington landfill, the Potential Impact Area is set out in Schedule "A". The Impact Evaluation Matrix is set out in Schedule "B". Once eligibility has been determined, it will not be removed. A person who owns property within the Potential Impact Area will hereafter be referred to as an "Eligible Property Owner". The list of Eligible Property Owners is attached as Schedule "C".

II PROPOSED COMPENSATION POLICIES

In an effort to help the local residents/owners stay within the community, Laidlaw Waste Systems (Storrington) Ltd. ("Laidlaw") will implement the following policies:

(a) Property Specific Compensation

Despite all the on-site mitigation measures proposed by Laidlaw to minimize and eliminate off-site impacts, the potential exists that periodic off-site impacts will occur.

The following principles apply:

- immediately following the issuance of the original Certificate of Approval or Provisional Certificate of Approval to Laidlaw in a form and on terms acceptable to Laidlaw, that is the subject of the Application for a Certificate of Approval for a Waste Disposal Site (Landfill) dated September 26, 1989 (hereinafter referred to as "Certificate of Approval"), Laidlaw representatives will approach each Eligible Property Owner to discuss the following:
 - the rationale for including the property owner in the Potential Impact Area;
 - the possible property specific compensation opportunities that are available to address the potential impacts;
 - the manner in which the Eligible Property Owner is to bring his/her specific complaint regarding the operation of the Storrington landfill to Laidlaw's attention.
- examples of property-specific compensation include installation of air-conditioning for dust impacts, improved window glazing for noise impacts, tree planting, fencing, landscaping for visual impacts;
- upon notification from the Eligible Property Owner that he/she has a specific complaint concerning the operation of the Storrington landfill, Laidlaw will immediately review the complaint with the assistance of the Eligible Property Owner and will present various opportunities to him or her that will address the Eligible Property Owner's individual needs and sensitivities;

- if a property within the Potential Impact Area is sold during the operating life of the Storrington landfill, property specific compensation will be available to the subsequent owner if the Eligible Property Owner, who owns his/her property on the day the Certificate of Approval is issued to Laidlaw, did not take advantage of this policy or if the subsequent property owner incurs an impact for which the Eligible Property Owner was not compensated;
- it is the intent of this policy to provide opportunities to respond to potential off-site physical impacts such as noise, dust and visual impacts. It is anticipated by Laidlaw that any request by an Eligible Property Owner will be resolved in an expeditious, cooperative manner. In the event that a dispute arises and agreement between the parties does not appear likely or timely, an independent arbitrator will be called upon to assist the parties. The arbitrator will be designated by the Public Liaison Committee for the Storrington landfill. The parties agree to be bound by the decision of the arbitrator. The costs of the arbitration will be borne by Laidlaw.

(b) Damage Claims Resolution

Although not anticipated, it is possible that unusual incidents could occur where direct physical damage to property could occur as a result of the operation of the Storrington landfill. Monitoring by Laidlaw must demonstrate that the damage incurred is a direct result of the operation of the Storrington landfill. If the damage claim is made out, Laidlaw will arrange for repairs/replacement as necessary.

In the event that a dispute arises between Laidlaw and the Eligible Property Owner, and it appears that a resolution between the parties is not likely or timely, an independent arbitrator will be called upon to assist the parties. The arbitrator will be selected by the Public Liaison Committee for the Storrington landfill. The parties agree to be bound by the decision of the arbitrator. The costs of the arbitration will be borne by Laidlaw.

(c) **Host Municipality Compensation**

Laidlaw recognizes that the host municipality should not be required to incur a decrease in its tax base as a result of the operation of the Storrington landfill. Laidlaw proposes to reimburse the host municipality for any tax revenue loss if assessment appeals lead to reduced assessments as a result of the operation of the Storrington landfill. This policy will be in effect throughout the operating life of the Storrington landfill. This compensation is in addition to any agreement entered into between Laidlaw and the host municipality.

III PROPERTY VALUE PROTECTION POLICY

Laidlaw proposes to ensure that an Eligible Property Owner does not suffer a loss on the sale of his/her property because of the operation of the Storrington landfill. This policy will therefore ensure that an Eligible Property Owner will obtain fair market value for his/her property.

The following principles apply:

- This policy applies only to (1) an Eligible Property Owner who owns his/her property on the day the original Certificate of Approval is issued to Laidlaw, and, (2) the respective spouse, son(s) or daughter(s) of the Eligible Property Owner who acquire the property, included in the Potential Impact Area, subsequent to the issuance of the original Certificate of Approval to Laidlaw;
- This policy will remain in force until the last day waste is received at the Storrington landfill;
- This policy applies to arm's length transactions;
- The Eligible Property Owner shall inform Laidlaw of the intention to sell his/her property prior to listing the property for sale;

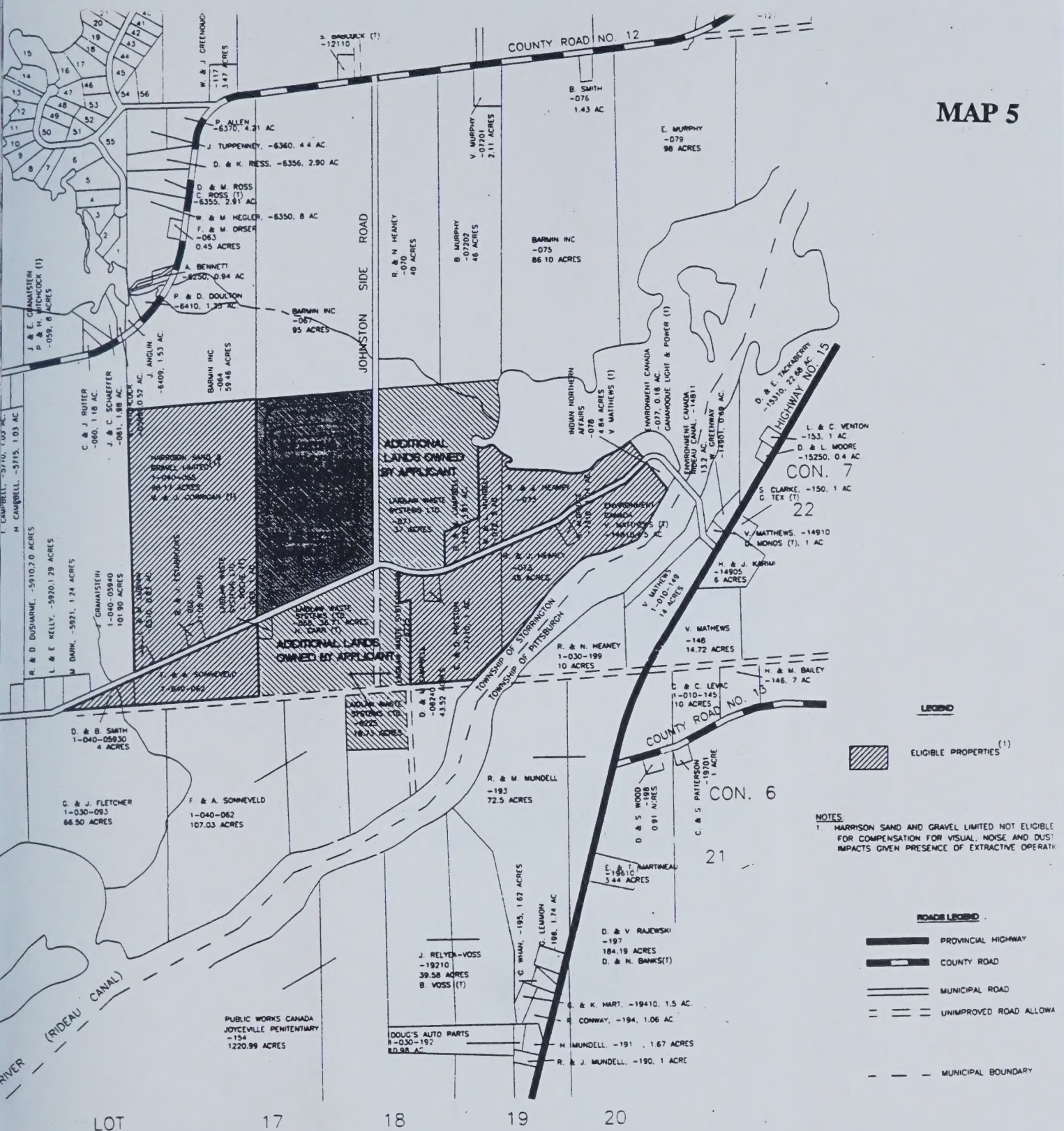
- Laidlaw and the Eligible Property Owner will agree on the fair market value of the property prior to the property being listed for sale;
- The fair market value will be determined as follows:

Two appraisals, one on behalf of Laidlaw and one on behalf of the Eligible Property Owner, will be obtained and paid for by Laidlaw. If the appraisals vary by more than 25% and the average of the two appraisals is not acceptable to either Laidlaw or the Eligible Property Owner, then a third appraisal shall be made. The third appraiser shall be chosen by the first two appraisers and paid for by Laidlaw. The fair market value will be the average of the two closest appraisals;

- All appraisals shall be determined according to sales of comparable properties in comparable communities where there is no landfill;
- The Eligible Property Owner shall list his/her property for sale with a knowledgeable real estate agent in the area;
- The property must be listed with the realtor for six months;
- Any purchase offers received during the six month period must be submitted to Laidlaw for review if the offers are less than the fair market value. As expeditiously as possible, Laidlaw will decide to either: (a) accept the offer and pay the difference between the accepted offer and the fair market value; (b) reject the offer; or, (c) acquire the property at fair market value;
- If no acceptable offer is received during the six month period, Laidlaw will acquire the property at fair market value;
- An Eligible Property Owner may sell his/her property to anyone at any time without allowing Laidlaw the first right of refusal. In that event, Laidlaw is under no obligation to provide property value compensation to the Eligible Property Owner;

- Laidlaw will reimburse the Eligible Property Owner for legal and relocation expenses up to a maximum total amount of \$5,000.00.

MAP 5



ELIGIBLE PROPERTIES PART LOTS 14 TO 23, CONCESSIONS 6, 7 AND 8 TOWNSHIP OF STORRINGTON

CA20NEA 93E01

Ontario, Environmental Assessment Board.

EA-91-01

LIDLAW WASTE SYSTEMS LIMITED - STORRINGTON L
SITE REASONS FOR DECISION AND DECISION... 199

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